Attachment H

Proposal # 2001- K-218 (Office Use Only)

PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Butte Creek, Big Chico Creek, and Sutter Bypass Chinook Salmon and Steelhead Evaluation
Applicant Name: California Department of Fish and Game
Contact Name: Katherine Hill, Associate Fishery Biologist, CDFG
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Amount of funding requested: $522,529 over three years
Some entities charge different costs dependent on the source of the funds. If it is different for state or federal funds list below.
State cost _____ Federal cost _____

Cost share partners? ✓ Yes ___ **No**
Identify partners and amount contributed by each CDFG, $165,000 per year
FRA, $98,000 per year

Indicate the Topic for which you are applying (check only one box).

- ☐ Natural Flow Regimes
- ☐ Nonnative Invasive Species
- ☐ Channel Dynamics/Sediment Transport
- ☐ flood Management
- ☐ Shallow Water Tidal/ Marsh Habitat
- ☐ Contaminants
- ☐ Beyond the Riparian Corridor
- ☐ Local Watershed Stewardship
- ☐ Environmental Education
- ☐ Special Status Species Surveys and Studies
- ☑ Fishery Monitoring, Assessmentand Research
- ☐ Fish Screens

What county or counties is the project located in? Butte and Sutter Counties

What CALFED ecozone is the project located in? See attached list and indicate number. Be as specific as possible 7.5, 7.6, 7.7, and 8.4

Indicate the **type** of applicant (check only one box):

- ☑ State agency
- ☐ Public/Non-profit joint venture
- ☐ Local government/district
- ☐ University
- ☐ Other: _____
- ☐ Federal agency
- ☐ Non-profit
- ☐ Tribes
- ☐ Private party

Indicate the primary species which the proposal addresses (check all that apply):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☑ Winter-run chinook salmon
- ☑ Spring-run chinook salmon
- ☑ Late-fall run chinook salmon
- ☑ Fall-run chinook salmon
- ☐ Delta smelt
- ☐ Longfin smelt
- ☑ Splittail
- ☑ Steelhead trout
- ☐ Green sturgeon
- ☐ Striped bass
- ☐ White Sturgeon
- ☑ All chinook species
- ☐ Waterfowl and Shorebirds
- ☐ All anadromous salmonids
- ☐ Migratory birds
- ☐ American shad
- ☐ Other listed T/E species: _____

Indicate the type of project (check only one box):

- ☑ Research/Monitoring
- ☐ Watershed Planning
- ☐ Pilot/Demo Project
- ☐ Education
- ☐ Full-scale Implementation

Is this a next-phase of an ongoing project? Yes ✓ No ___
Have you received funding from CALFED before? Yes ___ No ✓

If yes, list project title and CALFED number _____

Have you received funding from CVPIA before? Yes ✓ No ___

If yes, list CVPIA program providing funding, project title and CVPIA number (if applicable):

CDFG contract FGR-4974-IF. Funded by AFRP

By signing below, the applicant declares the following:

- The truthfulness of all representations in their proposal;
- The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section **2.4)** and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Katherine A. Hill
Printed name of applicant

Katherine A. Hill
Signature of applicant

Executive Summary

A. Project Title, Amonnt Requested

Butte Creek, Big Chico Creek, and Sutter Bypass Chinook Salmon and Steelhead Evaluation: $522,529 over three years

B. Applicants Name, Participants and Collaborators

California Department of Fish and Game, Sacramento Valley Central Sierra Region 1701 Nimbus Road, Suite A, Rancho Cordova, California 95670. Project Manager – Katherine Hill, Associate Fishery Biologist, California Department of Fish and Game
Phone: (916) 358-2945, FAX: (916) 358-2912, E-mail: Khill@dfg.ca.gov

C. Location

Butte and Big Chico creeks located in Butte and Sutter Counties.

D. Type/Objective of the Project

This is a monitoring program that is soliciting next-phase funding. The objective of this project is to gain more knowledge in: the life history and relative abundance of spring-run chinook salmon (SRCS), adult steelhead and fall-run chinook salmon migration timing and relative abundance, and rearing patterns for juvenile SRCS.

E. Approach Being Taken

Data collection will be done by the use of: rotary screw traps, a diversion screen trap, adult escapement surveys, adult fall-run chinook salmon and steelhead trapping, and coded-wire tagging of naturally-produced spring-run chinook salmon.

F. Hypotheses Being Tested

1. Measuring fish population trends and relative abundance of juvenile SRCS is used to indicate recovery of SRCS.
2. The Sutter Bypass is critical habitat for the rearing of juvenile SRCS.
3. The null hypothesis is that there is no difference in the survival of salmon that use the Sutter Bypass than those that did not use Sutter Bypass.
4. Recovery of tagged SRCS by other projects will give insight into the timing and size of emigrating juvenile salmon through the Delta and the contribution of SRCS to the ocean harvest.

G. Uncertainties Involved

Monitoring rotary screw traps during high winter flows is unlikely, when most juvenile salmonids may be moving downstream; adult escapement is determined by snorkel survey, which generally under-estimates fish populations.

H. Expected Outcomes

This project will continue to document life history of Central Valley SRCS. The project will gain information on steelhead and fall-run chinook salmon migration timing and abundance. Coded-wire tagging will allow for an evaluation of juvenile rearing patterns and the contribution of Central Valley SRCS to the ocean harvest.

I. Applicability to CalFed ERP Goals

This project benefits at-risk species of fish in Butte creek and Big Chico creek by documenting life history and effects of restoration projects on population levels. It will document use of freshwater shallow floodplains for nursery habitat by salmonids, and the project documents the CalFed ERP goal of maintaining or enhancing populations of salmonids for commercial and recreational harvest. Progress toward the CVPIA goal of doubling natural production of anadromous fishes will be evaluated in Butte and Big Chico Creeks.

. Project Description

The California Department of Fish and Game request funds from CALFED and CVPIA to continue targeted anadromous fisheries research on Butte and Big Chico Creeks. Spring-run chinook salmon and steelhead trout populations exist in these two waters, but there is a lack of information about basic life history and population levels. Information generated by the proposed project will help evaluate the effectiveness of many fish restoration projects that are intended to improve the anadromous fish populations in these two watersheds.

Statement **of** the Problem

Problem: Fish restoration projects have been implemented and are planned to restore at-risk anadromous salmonid populations in Butte and Big Chico creeks. These projects include fish ladders, fish screens, dam removal and flow augmentation. The proposed project is critical for evaluating the effectiveness of these projects. Spring-run chinook salmon (SRCS), ***Oncorhynchustshawytscha,*** are listed **as** threatened under **both** the California and Federal Endangered Species Acts. Butte Creek is one of only three ***streams*** that form a basis for population trends of SRCS in the Central Valley of California. Nearby Mill and Deer creeks are the other two streams. Big Chico creek supports a remnant population of SRCS, and both Butte and Big Chico creeks support steelhead rainbow trout, ***Oncorhynchus mykiss.*** Steelhead **are** listed as threatened under the Federal Endangered Species Act.

The purpose of this proposed project is: 1) to build on our knowledge of the life history of spring-run chinook salmon in Butte and Big Chico creeks and relate this knowledge to fish restoration projects, 2) to evaluate steelhead trout adult migration timing and abundance in Butte creek, and **3)** to evaluate the importance of the Sutter Bypass to the rearing of juvenile salmon.

Spring-run chinook salmon life history and population trends are documentation by:

- Determination of spawner escapement
- Monitoring of time of alevin emergence
- Documentation of juvenile salmon size at emigration
- Measuring relative abundance
- Monitoring of instream rearing and emigration patterns
- Determination of contribution to ocean harvest
- Determination of growth rates

Steelhead trout life history and adult escapement documentation will be accomplished by:

- Trapping adult steelhead at selected sites

The importance of the Sutter Bypass to the rearing of juvenile salmon will be evaluated by:

- Determination of differential survival of juveniles in the Sutter Bypass versus the mainstem Sacramento River through paired releases of coded wire-tagged salmon obtained from Coleman National Fish Hatchery

In 1995, The California Department of Fish and Game (CDFG) began a life history of spring-run chinook salmon in Butte Creek. To date, one final report has been completed with the project's findings for 1995 to 1998 (Attachment 1). Adult escapement was estimated and used to estimate trends in the population. Further measurement of adult escapement will be used to estimate cohort replacement and thus will be used to make statements as to the recovery of spring-run chinook salmon in the Central Valley.

The current project has indicated the importance of the Sutter Bypass as nursery habitat for emigrating juvenile SRCS and mainstem salmonids. Growth rate of juvenile Butte Creek SRCS was documented through the use of coded-wire tagged (CWT) salmon. We have shown that SRCS remain in the Sutter Bypass during the winter and early spring and grow to a large size before entering the mainstem Sacramento River. Sommer, *et al.* 2000, documented a similar result from chinook salmon rearing in the Yolo Bypass and found that salmon grow at a faster rate in the Yolo Bypass than in the mainstem Sacramento River.[1] Fish are tracked as they move downstream through the mainstem Sacramento River, Delta, and to the ocean through the Use of tagged Butte Creek SRCS. To date, there has not been enough information from these tagged fish to conclude how and when these fish use environments outside the Butte Creek basin. More tagged fish over the next several years are needed.

Completion of this proposed project will help evaluate the progress toward the ERP strategic goal of achieving recovery of at-risk native species. By continuing the documentation of SRCS life history and population trends, a clearer picture of what is needed for these fish to ensure their survival and to increase in numbers.

Conceptual Model: A comprehensive evaluation of all available information led to the framework of this conceptual model. Information from the current study has given a general understanding of the ecosystem process of the watershed. Through our evaluation, we have identified areas that need to be researched. These areas are the importance of the Sutter Bypass for juvenile rearing, timing and size of SRCS emigrating through the Delta, and contribution of SRCS to ocean harvest. This research will provide a guide the evaluation, refinement, and prioritization of restoration projects in the Bay-Delta ecosystem.

Hypotheses Being Tested: The research areas have led to the following hypotheses:

1. Measuring fish population trends and relative abundance of juvenile SRCS are used to indicate recovery or well being of SRCS. Once recovery numbers have been agreed upon population trends can be compared to stated trends. For now, only adult escapement and relative abundance of juveniles are measured.

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[1] Sommer, T.R 2000. Floodplain Rearing of Juvenile Chinook Salmon: Evidence of Enhanced Growth and Survival. Draft submitted to Canadian Journal of Fisheries and Aquatic Sciences

2. The Sutter Bypass is critical habitat for the rearing of juvenile SRCS. The tagged fish indicates growth condition factor and residence time.

3. Experimental salmon released in the Sutter Bypass and in the Sacramento River at the Sutter Bypass will be used to examine the survival of salmon using the Sutter Bypass and not using the Sutter Bypass. The null hypothesis is that there is no difference in the survival of salmon that use the Sutter Bypass than those that did not use Sutter Bypass.

4. Information gained fiom the recovery of tagged SRCS by other projects will give insight into the timing and size of emigrating juvenile salmon through the Delta and the contribution of SRCS to the ocean harvest. This is a monitoring program and stating a hypothesis is not needed.

Adaptive Management: The proposed project is for continuation and expansion of targeted research and monitoring. As our understanding of the Butte and Big Chico Creeks' fisheries and ecosystem improves, resource managers and stakeholders will be able to direct restoration activities, and to evaluate the success of past restoration projects.

Proposed Scope of Work

Location and/or Geographic Boundaries of the Project: The project area includes Butte Creek downstream of Centerville Head Dam, inclusive of the Butte Basin (Butte Creek and Butte Sink) and the Sutter Basin (Sutter Bypass). The Butte Creek components occur in Butte and Sutter counties. The project also includes Big Chico Creek fiom Higgins Hole, to the confluence with the mainstem Sacramento River. Big Chico Creek is in the Butte Basin, Butte County. This proposal includes CALFED Ecological Management Zones are number 7.5, 7.6, 7.7, and 8.4. A map is provided (Attachment 2).

Approach: The first purpose of the proposed project is to continue documenting SRCS life history strategies. The study determines annual adult SRCS escapement. Adult counts are provided by a snorkel survey. Spring-run chinook salmon immigrate into Butte Creek during the months of February to June. They over-summer in deep holding pools. The survey is conducted in August when salmon are holding in the pools prior to spawning. The entire known SRCS holding habitat is surveyed. An estimate of the population is recorded. Escapement is used for population trends and as an indicator of attainment of recovery goals for SRCS.

Other focuses of the life history studies are monitoring time of alevin emergence, documenting size of juvenile SRCS at emigration, measuring relative abundance, and monitoring instream rearing and emigration patterns. These four objectives are

determined by the operation of rotary screw traps and one diversion screen trap. Trapping is continuous through the juvenile salmon outmigration period (October through June). Juvenile fish trapping locations for Butte Creek will be at 1) Parrott-Phelan Dam: One rotary screw trap and one diversion screen trap. 2) Sutter Bypass, West Borrow, Weir 1 (Sutter National Wildlife Refuge): One to two rotary screw traps. 3) East Borrow, Weir 2: One rotary screw trap. The fish trapping location on Big Chico Creek will be at Bidwell Park golf course.

Recording the salmon fry captured in the Parrott-Phelan Dam rotary screw trap and/or diversion screen trap will help determine the timing of alevin emergence. The Parrott-Phelan Dam site is immediately downstream of the SRCS holding and spawning area. Fry emergence is also recorded by comparing peak spawning activity with daily water temperatures. Determination of peak spawning is conducted by weekly walking surveys that evaluate the spawning region. Temperature is recorded by a thermograph that is deployed in the same area. By knowing timing of spawning and daily water temperatures, thermal units can be determined which allow for determination of emergence.

Size of juvenile SRCS at emigration, relative abundance, and emigration patterns will be determined by the operation of the rotary screw traps at all locations. Abundance of juvenile salmon is defined in relative terms. Total abundance determination is not attainable due to many factors on Butte and Big Chico Creeks. These factors include high flow events, excessive debris, and operational practices of the diversion structures to which the fish traps are attached. Because Butte and Big Chico creeks are essentially undammed, stream flow varies widely. The traps often cannot be fished during winter storms, when the majority of juvenile salmon may be movitig downstream. Climatic and hydrologic conditions permitting, the rotary screw traps are fished seven days per week and twenty-four hours per day. Daily fish capture is recorded. Lengths and weights of the salmon are taken to determine average length and condition of the juveniles. Bi-weekly catch summaries and length frequency graphs are generated fiom the catch data Evaluating this information will help assess the life history strategy of SRCS. An additional benefit of operating rotary screw traps is the information gathered about other fish species. Rotary screw traps capture other fish species present in the system, so valuable information is gained about steelhead trout, fall- and late-fall run chinook salmon, sturgeon, Sacramento splittail, and many other species of concern.

Another focus of the project is the determination of SRCS contribution to ocean harvest. A coded-wire tagging program began four years ago. Juvenile salmon captured at the uppermost Parrott-Phelan Dam site are coded-wire tagged as they are captured. The goal of the proposed project is to tag 100,000 juvenile SRCS each year, so that tagged SRCS can be recovered in the ocean fishery. However, these are natural stock salmon and attainment of 100,000 tagged is dependent on many variables (i.e. run size, ability to trap successfully, etc.) By releasing a large population of tagged salmon, we hope to gain valuable information on the contribution to the ocean harvest. This proposed project will rely on the recovery of these salmon by commercial and sport fishing efforts.

The last study involving life history strategy is to evaluate rearing habitat use of juvenile salmon in the Sutter Bypass. Rotary screw traps in the Sutter Bypass are used to capture coded-wire tagged salmon released from upper Butte Creek. Growth rates of recovered tagged SRCS can be estimated because tag codes are changed every 10 to 20 days. Growth rate is calculated by dividing the difference between mean size at release ($FL_{Release}$) and size at recovery ($FL_{Recovery}$) by the difference in the number of days (d) between median release date and recovery date ($FL_{Recovery}-FL_{Release}/d_{Recovery-Release}$). Determination of growth rate and residence time will allow evaluation of the Sutter Bypass as nursery habitat for juvenile chinook salmon. Additional SRCS coded-wire tag recoveries from downstream of the Sutter Bypass will give important insight into the timiig of spring-run salmon presence in the mainstem Sacramento River and Delta. These downstream tag recoveries will be from other researchers.

The second purpose of the proposed project is to evaluate adult fall-run chinook salmon and steelhead trout migration timing and abundance in Butte Creek. A trap will be incorporated into the fish ladder at Durham Mutual dam or Parrott-Phelan diversion dam on Butte Creek. This trap will monitor adult salmonid passage beginniig in September and ending when high winter flows prevent operation of the trap. The entire fall-run salmon migration period will be covered, but only the early part of the steelhead migration period. This trapping effort allows monitoring of adult salmonid movement in the fall, and it will also allow fall-run chinook salmon to be excluded from the spring-run chinook salmon spawning area. Adult steelhead will be captured and recorded, but will be released upstream of the trap to continue their upstream migration. Adult salmonid protection is of primary importance and the trap will be designed so that fish will be able to escape if a high flow event prevents workers from reaching the trap. The trap will be monitored at least once per day – more often if needed to assure fish survival.

The final purpose of the proposed project is to evaluate differential survival of juvenile chinook salmon reared partially in the Sutter Bypass compared with juvenile chinook salmon that do not use the Sutter Bypass, Up to 200,000 chinook salmon from Coleman National Fish Hatchery will be coded-wire tagged in two tag groups. The tagged salmon will be either fall- or late-fall salmon. Half will be released at the top of the Sutter Bypass and half will be released in the mainstem Sacramento River adjacent to the Sutter Bypass. The paired releases will occur in March. The tagged salmon will be approximately 45 mm fork length at release, which is the average size of Butte Creek SRCS in March. Differential survival will be determined by comparison of ocean harvest rates of each tag group.

Data Handling and Storage: Field sampling data are entered into a relational database at least once per week and are exported to the Interagency Ecological Program server in Sacramento. Once per week, a backup is made of the database on removable media. The backup is stored at a site remote from the CDFG offices. Original field data sheets are kept at the CDFG Rancho Cordova office and photocopies are kept at CDFG's Chico field office.

Expected **Products/Outcomes:** CDFG's project manager will prepare and submit quarterly progress reports. Progress reports will be submitted to CALFED by the 10th day of the month following the end of the quarter. Progress reports will include project financial information, progress toward achieving the objectives stated in this proposal, and problems and/or delays encountered in the study. If needed, a description of any modifications to the project contract will be outliied. Annual reports will be prepared, as well as a comprehensive report at the end of the three year project. This final project report will summarize the nine years that the study will have spanned. Project staff are participants in the Spring-run Salmon Workgroup, the Delta sub-team of the Interagency Ecological Program, and other workshops.

Public outreach will be established through local stakeholder meetings. Presentations are regularly made at the Butte Creek Watershed Conservancy and Big Chico Creek Watershed Alliance meetings, educational workshops conducted by California State University, Chico, and local public meetings. Project updates have been and will be presented in all of these forums.

Work Schedule:

Table 1. - Activity description, starting and ending date of SRCS monitoring on Butte and Big Chico Creeks.

#	Task	Start	End	Frequency	Deliverable
1	Adult Escapement Surveys	Mid-August	End-August	Annual	Annual Report Final Report
2	Juvenile Monitoring	October	June	Annual	Annual Report Final report
3	Coded-Wire Tagging Program	December	May	Annual	Annual Report Final Report
4	Adult trapping of fall-run salmon and steelhead	September	Approx. December	Annual	Annual Report Final Report
5	Sutter Bypass Survival Study – Paired Releases	Mid-February	End-March	Annual	Annual Report Final Report

Tasks 1, 2 and 3 are inseparable components of the proposed project. These tasks are needed for the long-term evaluation of the recovery of SRCS.

Feasibility: The proposed project is a continuation of the existing Butte Creek Juvenile Spring-run Chinook Salmon Life History Evaluation – currently in its fifth year. The approaches previously described have proven to be effective methods for the documentation of the life history strategy of SRCS. Meeting the goals stated in this proposal should be attainable within the three-year time frame. However, climatic conditions dictate the success of each sampliig year. Operation of rotary screw traps is

not feasible at exceptional water flows. In the event of an extremely high water years, the proposed project may need to be extended an additional sampling season.

Trapping of adult salmonids during the fall season is a new aspect of the project, and presents more uncertainty. However, CDFG has extensive experience trapping and handling adult salmon, including recent experience with adult salmonid trapping on the lower Yuba River. There is the possibility that, for unforeseen technical reasons, trapping of adults will be impossible. We will implement a video-monitoring station at the same site if trapping proves unfeasible.

Completing the proposed project in three years, will provide an nine-year evaluation of SRCS in Butte Creek, and a five-year evaluation in Big Chico Creek. Achievements of the evaluation will be a basis for adult spawner population trends, timing of juvenile salmon presence in the Butte and Big Chico creeks, estimation of growth-rate of juvenile SRCS using the Sutter Bypass for rearing, and information, through CWT recoveries, on timing of Butte Creek SRCS in the mainstem Sacramento River, Delta, and ocean fishery.

The project sites have already been established. For Butte Creek, permission to monitor at the Parrott-Phelan Dam, West Borrow, Sutter Bypass, and East Borrow Sutter Bypass has been granted by M&T Ranch, USFWS, and DWR, respectively. These sites have been used since 1995, the onset of the Butte Creek SRCS evaluation. The City of Chico Parks and Recreation District has granted permission for the Big Chico Creek monitoring. Sampling began at this site in 1998.

Operation of the rotary screw trap in the Sutter Bypass requires an incidental take permit for winter-run chinook salmon. Winter-run chinook salmon are capable of entering the Sutter Bypass system during high flow events. The Sacramento River enters Butte Creek at the Butte Slough outfall gates, Moulton and Colusa Weirs, and the Tisdale Bypass during these high flows. The project has a Section 10 incidental winter-run chinook take permit issued by National Marine Fisheries Service (NMFS), which expires in 2001. We will submit applications for a three-year take permit extension for winter-run *salmon*, and any other species or subspecies that require take permits from NMFS or USFWS.

Applicability to CALFED ERP Goals/Implementation Plan/CVPIA Priorities

ERP Goals and CVPIA Priorities: The priorities for the 2001 Implementation Plan were developed using the ERP Strategic Goals and important scientific uncertainties identified by the Strategic Plan. The proposed project will aid CALFED in meeting the following strategic goals and address the identified scientific uncertainties.

ERP Strategic Goal 1 (At-Risk Species)- This goal places highest priority on restoring populations of at-risk native species by reversing downward population trends. The proposed project will continue documenting population trends of SRCS on Butte and Big Chico Creeks, and will expand to include evaluation of population trends of fall-run

chinook salmon and steelhead trout. Long-term monitoring of population size is needed to form a basis for comparison. Extending the current project for the proposed three years, will help gain information on spawner recruitment for different water year types. This proposed project also monitors the relative population abundance of juvenile SRCS by operation of the rotary screw trap program.

One of the stated scientific uncertainties is change to the natural flow regime. Hydrologic processes have a direct relationship to recruitment of the adult chinook spawning population. There is a need to determine fish passage flows past flow-related barriers. Butte Creek has several flow-related barriers. Some of these structures have been modified or removed, while others will be modified in the near future. This project has the ability to monitor the overall success of fish passage through these structures. Documentation of population trends will help determine the success of these and other restoration efforts.

ERP Strategic Goal **4** (Habitats)- There is a need for scientific research on flood bypasses as habitat. The proposed project will continue documenting use of the Sutter Bypass as nursery habitat by Butte Creek and mainstem Sacramento River salmonids. Continuation of the CWT program will allow further insight into the growth rates achieved by juvenile SRCS using this habitat type for a nursery.

A comparison of survival of hatchery salmon that use the Sutter Bypass as nursery habitat versus salmon that don't use the Bypass, will give us an overall estimation of the effect of the Sutter Bypass on juvenile salmon survival.

Rotary screw traps are used for the recovery of emigrating juvenile SRCS. **A** benefit of operating rotary screw traps is the ability to gather data on a wide range of fish species, including mainstem Sacramento River salmonids, splittail, striped bass, sturgeon, and many others (see Attachment 1). There is a need for long-term monitoring to assess the ecological health of this system and the processes that shape this habitat type.

ERP Strategic Goal **3** (Harvestable Species)-. Chinook salmon are important to both commercial and sport fishing, and there is a lack of information on the contribution by naturally-produced spring-run chinook salmon to the fishery. Tag recoveries from ocean-harvested Butte Creek SRCS allow an estimate of contribution to be made. There is a long-term need for the CWT program: Several years of releases will increase the number of tags recovered to allow a harvest estimate to be made.

CVPIA Goals: This project, because it is a monitoring project, evaluates the success of restoration project toward the goal of doubling natural production of anadromous fishes in Butte and Big Chico Creeks.

Relationship to Other Ecosystem Restoration Projects: The proposed project has its own goals and objectives, however it is related to several past and future projects. Past projects on Butte Creek include the reconstruction of Parrott-Phelan Dam fish ladder and implementation of a screened diversion at the same site, removal of McPherrin and McGowan Dams, the installation of the Western Canal Water District siphon, and the recent modification of the bifurcation at Sanborn Slough. The proposed project by design is a monitoring project. Long-term documentation of SRCS population trends will help document the success of these past restoration projects.

Future projects include modifications to weirs along the west borrow of the Sutter Bypass, consolidation of diversions along the east borrow of the Sutter Bypass, an instream flow requirement for anadromous fish study, and a gauging project in the Butte Sink area. Using previous SRCS population data for a basis, the proposed project will be able to determine the effects of these future projects.

Request for Next-Phase funding: The proposed project is a continuation of an existing project. The current status and findings to date are summarized in Appendix B.

Previous Recipients **of** CALFED **or CVPIA Funding:** The proposed project is a continuation of the current evaluation. The current project title is Butte Creek Spring-Run Chinook Salmon, ***Oncorhynchus*** *tshawytscha*, Juvenile Outmigration and Life History Evaluation. The Federal Aid in Sport Fish Restoration Program, California Grant No, has .granted previous funding for the project. F-51-R-11, Project 20, Job 1 and the Central Valley Anadromous Fish Restoration Program, CDFG contract No. FGR-4974-IF. **As** summarized in Appendix B, the project **has** documented basic life history strategies of spring-run chinook salmon in Butte and Big Chico Creeks. The project is currently funded for one additional year by CVPIA-AFRP and by Federal Aid in Sportfish Restoration Program.

System-Wide Ecosystem Benefits include the ability to track coded-wire tagged spring-run salmon from Butte Creek and determine their timing at the Delta pumping facilities and contribution to ocean harvest. This project, by documenting timing and relative abundance of fish species using the Sutter Bypass helps to understand the effects of shallow-water seasonal floodplains on anadromous and resident fishes.

Qualifications

The Department of Fish and Game, Sacramento Valley & Central Sierra Region, will oversee this project. The Regional Manager and Senior Fisheries Staff will provide guidance and support to insure that the project is completed in a timely and professional manner. The direct project manager is Ms. Katherine Hill, Associate Fishery Biologist for the California Department of Fish and Game. Ms Hill's supervisor is **Mr.** Ralph Carpenter, Senior Fisheries Biologist. Ms. Hill has lead anadromous fisheries research and monitoring activities for 11 years with CDFG, including the current Butte and Big

Chico Creeks spring-run chinook salmon study since it began in 1994. Ms. Hill will not be supported by CALFED or CVPIA funds.

Tracy McReynolds is the direct field sampliig lead. Ms. McReynolds is an Assistant Fisheries Biologist with CDFG and works under Katherine Hill's lead. She has been with the project since 1995 and will not be supported by CALFED or CVPIA funds.

The fishery biologist, data analyst and field technicians included in this proposal are not yet determined. They will be work under Katherine Hill's lead, but will be hired through the CSUChico Research Foundation.

costs

The total funding requested is $522,529 over three years (Table 1). This amount is needed to fund personnel to do the project. Fisheries research and monitoring of naturally produced anadromous fishes is labor-intensive and therefore, costly. All of the requested funding will be used for paying personnel costs. CDFG will provide all other costs, as detailed below. Secure funding to recruit and retain competent staff is needed to carry **out** the project effectively.

Field Technicians are temporary employees who do the fish trap monitoring, coded-wire tagging, data entry, equipment maintenance, and adult escapement surveys. They work under the direction of the project fishery biologist. There will be two full-time field technicians on the project fiom September through April, which is the main field sampliig season. There will be one full-time field technician during May through August.

The fishery biologist will act **as** direct field lead over the fisheries technicians and will work full-time year round. The biologist will work with the other fisheries biologist (not CALFED/CVPIA funded) to insure that the fieldwork is executed in a safe, consistent, and scientifically sound manner.

The data analyst will be responsible for quality control of data entry, analysis of all field sampliig data and for preparing summary reports. This person will work closely with the project manager on the quarterly and annual project reports. This person will also be the main coordinator between this project and the Interagency Ecological Program database managers. The data analyst will work full-time year round.

Cost Sharing

The requested funding is to provide personnel for the project. The Federal Aid in Sportfish Restoration Program (SFRA) and CDFG fund the project manager (Katherine Hill). CDFG funds the Chico fishery biologist, Tracy McReynolds and the CDFG Regional leaders and support staff. One screw trap, coded-wire tagging equipment, a tagging trailer and other equipment were funded through SFRA and Proposition 204. CDFG funds 2 full-time fish and wildlife scientific aids each year. CVPIA, Anadromous

Fish Restoration Program, provided funding for equipment and temporary personnel since 1995 through federal FY 1998-1999. All CDFG and SFRA funding is tentatively approved for the next year, and we expect that the current level of non-CALFED/CVPIA funding will continue for the next two to four years. The total funding contributed by SFRA, CDFG, and Proposition 204 is more than 50% of the total project cost.

Table 1. Annual and total budget for Butte and Big Chico Creeks, and Sutter Bypass Chinook Salmon and Steelhead Evaluation.

Overhead applies only to salaries, excluding Campus Coordinator, and not to benefits.

Year 1 05/01 - 04/02	Task	Field Technicians	Field Technician Benefits	Fishery Biologist	Fishery Biologist Benefits	Data Analyst	Data Analyst Benefits	Overhead	Campus Coordinator	Campus Coordinator Benefits	Total Cost
		3360 hours @$12.00 per hour	8%	$3000/mo	17% + $340 per month	$3000/mo	17% + $340 per month	18.50%	370 hours @$16.00 per hour	34%	
	Task 1	$0	$0	$10,800	$3,060	$5,400	$1,530	$2,997	$0	$0	$23,787
	Task 2	$10,080	$806	$7,200	$2,040	$12,600	$3,570	$5,528	$0	$0	$41,824
	Task 3	$10,080	$806	$7,200	$2,040	$0	$0	$3,197	$0	$0	$23,323
	Task 4	$10,080	$806	$7,200	$2,040	$10,800	$3,060	$5,195	$0	$0	$39,181
	Task 5	$10,080	$806	$3,600	$1,020	$7,200	$2,040	$3,863	$0	$0	$28,609
	Admin	$0	$0	$0	$0	$0	$0	$0	$5,920	$2,013	$7,933
Total Cost Year 1		**$40,320**	**$3,224**	**$36,000**	**$10,200**	**$36,000**	**$10,200**	**$20,780**	**$5,920**	**$2,013**	**$164,658**
Year 2 05/02 - 04/03	Task	Field Technicians 3360 h/yr	Field Technician Benefits	Fishery Biologist	Fishery Biologist Benefits	Data Analyst	Data Analyst Benefits	Overhead	Campus Coordinator	Campus Coordinator Benefits	Total Cost
		3360 hours @$12.60 per hour	8%	$3150/mo	19% + $340 per month	$3150/mo	19% + $340 per month	18.50%	370 hours @$16.80 per hour	34%	
	Task 1	$0	$0	$11,340	$3,379	$5,670	$1,689	$3,147	$0	$0	$25,225
	Task 2	$10,584	$847	$7,560	$1,512	$13,230	$3,942	$5,804	$0	$0	$43,479
	Task 3	$10,584	$847	$7,560	$1,512	$0	$0	$3,357	$0	$0	$23,860
	Task 4	$10,584	$847	$7,560	$1,512	$11,340	$3,379	$5,455	$0	$0	$40,677
	Task 5	$10,584	$847	$3,780	$1,126	$7,560	$1,512	$4,056	$0	$0	$29,465
	Admin	$0	$0	$0	$0	$0	$0	$0	$6,216	$2,114	$8,330
Total Cost Year 2		**$42,336**	**$3,388**	**$37,800**	**$11,262**	**$37,800**	**$11,262**	**$21,818**	**$6,216**	**$2,114**	**$173,996**
Year 3 05/03 - 04/04	Task	Field Technicians 3360 h/yr	Field Technician Benefits	Fishery Biologist	Fishery Biologist Benefits	Data Analyst	Data Analyst Benefits	Overhead	Campus Coordinator	Campus Coordinator Benefits	Total Cost
		3360 hours @$13.23 per hour	8%	$3308/mo	21% + $340 per month	$3308/mo	21% + $340 per month	18.50%	370 hours @$17.64 per hour	34%	
	Task 1	$0	$0	$11,907	$3,724	$5,953	$1,863	$3,305	$0	$0	$26,752
	Task 2	$11,113	$889	$7,938	$2,483	$13,892	$4,345	$6,094	$0	$0	$46,754
	Task 3	$11,113	$889	$7,938	$2,483	$0	$0	$3,524	$0	$0	$25,947
	Task 4	$11,113	$889	$7,938	$2,483	$11,907	$3,724	$5,727	$0	$0	$43,781
	Task 5	$11,113	$889	$3,969	$1,242	$7,938	$2,483	$4,259	$0	$0	$31,893
	Admin	$0	$0	$0	$0	$0	$0	$0	$6,527	$2,220	$8,747
Total Cost Year 3		**$44,453**	**$3,556**	**$39,690**	**$12,415**	**$39,690**	**$12,415**	**$22,909**	**$6,527**	**$2,220**	**$183,875**
Total Project Cost		**$127,109**	**$10,168**	**$113,490**	**$33,877**	**$113,490**	**$33,877**	**$65,507**	**$18,663**	**$6,347**	**$522,529**

Local Involvement

The proposed project's plan for public outreach involves many constituents. Local support has been a key factor in the success of the study to date. Our goal is to keep the public informed and keep the support of the local landowners. Permission to access private land has been and will be obtained. Many of the local landowners participate in the Butte Creek Conservancy and Big Chico Creek Alliance. Both of these watershed groups are supportive of the proposed project. Many different stakeholders form the group including university groups, government agencies, landowners, local farmers, other interested organizations, and the general public. The conservancies are the principle method for keeping the local stakeholders informed.

Another method of transmitting project information is through the local university. The Chico University Research Foundation administers funding for the current and proposed project and they receive frequent project update reports. California State University, Chico has held educational workshops open to *the* public. We have presented results of our study at previous workshops and intend to participate in future events.

Professionals, as well as the general public, also participate in the Spring-Run Workgroup. A monthly meeting is held at a location in the North State. Central Valley and North Coast issues are discussed. Issues include, but are not limited to, restoration efforts, watershed issues, and research projects. The project's progress is updated at each meeting.

Public outreach is ongoing. Local support is essential for the success of the project.

Compliance with Standard Terms and Conditions

This project will comply with all Standard Terms and Conditions as stated in the 2001 Proposal Solicitation Package.

Agreement No.:_____

Exhibit:_____

STANDARD CLAUSES –
INTERAGENCY AGREEMENTS

Audit Clause. For Agreements in excess of $10,000, the parties shall be subject to the examination and audit of the State Auditor for a period *of* three years after final payment under the Agreement. (Government Code Section 8546.7).

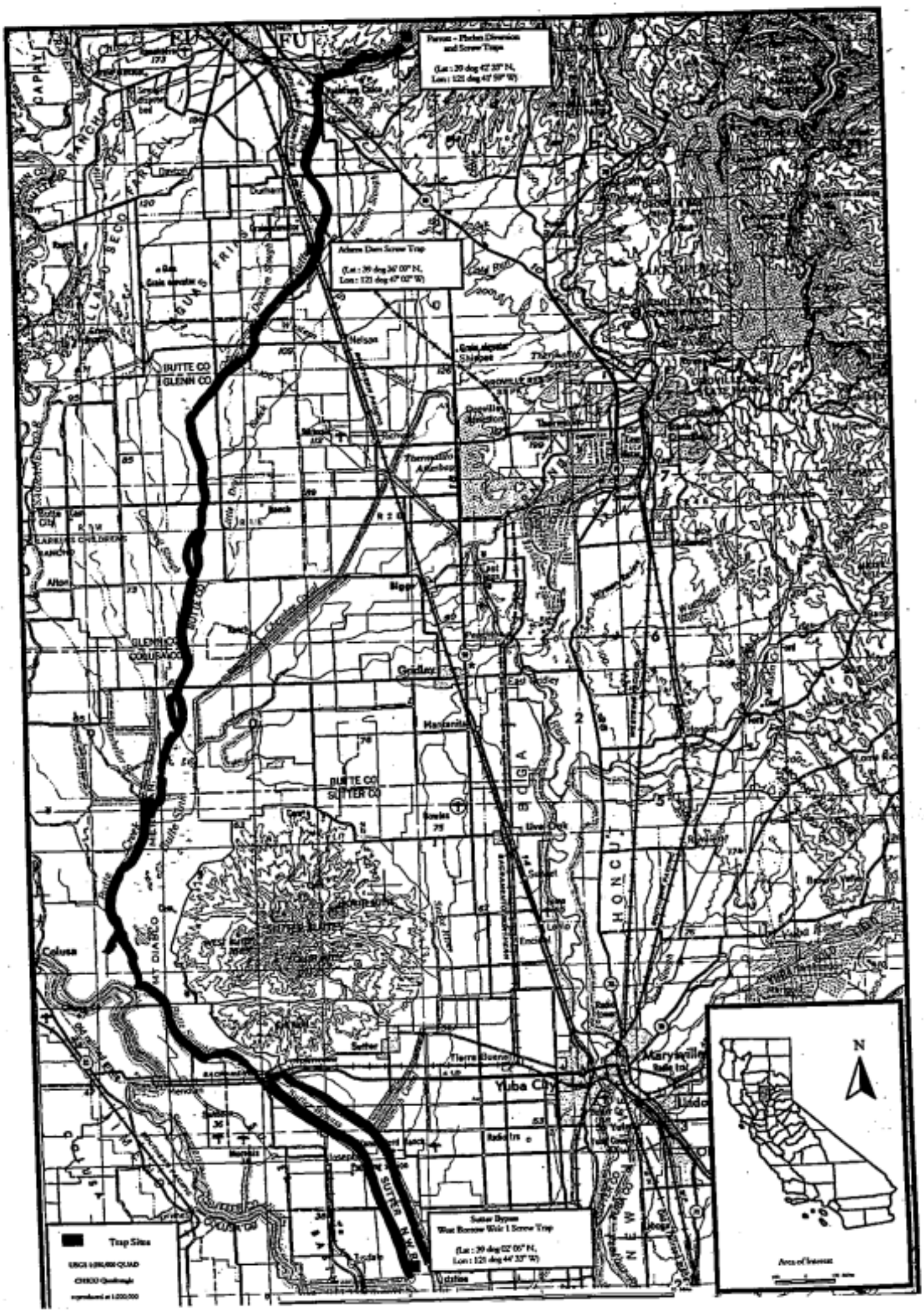
Availability **of** Funds. Work to be performed under this Agreement is subject to availability of funds through the State's normal budget process.

Interagency Payment **Clause.** For services provided under this Agreement, charges will be computed in accordance with State Administrative Manual Sections 8752 and 8752.1.

Termination Clause. Either State agency may terminate this Agreement upon thirty (30) days' advance written notice. The State agency providing the services shall be reimbursed for all reasonable expenses incurred up to the date of termination.

Severability. **If** any provision ***of*** this Agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable, and binding on the parties.

Y2K Language. The Contractor warrants and represents that the goods or services sold, leased, or licensed to the State *of* California, its agencies, or its political subdivisions, pursuant to this Agreement are "Year 2000 compliant" For purposes of this Agreement, a good or service is Year 2000 compliant if it will continue to fully function before, at, and after the Year 2000 without interruption and, if applicable, with full ahility to accurately and unambiguously process, display, compare, calculate, manipulate, and otherwise utilize date information. This warranty and representation supersedes all warranty disclaimers and limitations and all limitations on liability provided by or through the Contractor.


Parrott - Phelan Diversion and Screw Traps
(Lat : 39 deg 42' 35" N, Lon : 121 deg 43' 59" W)
Adams Dam Screw Trap
(Lat : 39 deg 36' 05" N, Lon : 121 deg 47' 02" W)
Sutter Bypass West Borrow Wide 1 Screw Trap
(Lat : 39 deg 02' 05" N, Lon : 121 deg 44' 33" W)
Trap Sites
N
Area of Interest

California Department of Fish and Game

1701 Nimbus Rd. Suite A
Rancho Cordova, CA 95670

Phone (916) 358-2900

Monday, May 15, 2000

Butte County
Clerk of the Board of Supervisors
25 County Center Dr.
Oroville, CA 95965

Sutter County
Clerk of the Board of Supervisors
1160 Civic Center Blvd.
Yuba City, CA 95993

Mr. Tom Last
Butte County Planning Commission
7 county Center Dr.
Oroville, California 95965

Mr. Tom Parilo, Developmental Services Director
Sutter County Planning Department
1160 Civic Center Blvd
Yuba City, CA 95993

Mr. Charles Kutz
Butte Creek Watershed Conservancy
602 Sycamore St.
Chico, CA 95927

Ms. Suzanne Gibbs
Big Chico Creek Watershed Alliance
P.O. Box 1611
Chico, CA 95928

Dear

This letter is to notify you that the California Department of Fish and Game (Department) intends to file a proposal for funding with CALFED/CVPIA to continue an existing project in Butte and Sutter counties for an additional three years. Please refer to attached proposal.

The existing project is a life history study of spring-run chinook salmon in Butte and Big Chico creeks. This project began in 1995. As spring-run chinook salmon are listed as threatened under the California Endangered Species Act, this program carries urgency and importance. The study focuses on when and how the freshwater life stages of spring-run chinook salmon use Butte and Big Chico creeks specifically and the Butte Basin. The project area for Butte Creek is downstream of Centerville Head Dam, inclusive of the Butte Basin and the Sutter Bypass. The project area for Big Chico Creek extends downstream of Higgins Hole, to its confluence with the Sacramento River.

If you have any questions, please contact Ms. Katherine Hill, Associate Fishery Biologist at (916) 358-2945.

Sincerely,

Banky E. Curtis
Regional Manager

Enclosures

Land Use Checklist

All applicants must fill out this Land Use Checklist for their proposal. Applications must contain answers to the following questions to be responsive and to be considered for funding. *Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.*

1. Do the actions in the proposal involve physical changes to the land (i.e. grading, planting vegetation, **or** breeching levees) **or** restrictions in land use (i.e. conservation easement **or** placement of land in a wildlife refuge)?

   YES ✓ NO

2. **If NO to # 1, explain what type of actions are involved in the proposal (i.e., research only, planning only).**
   Research only

3. **If** YES to # **1,** what **is** the proposed land use change **or** restriction under the proposal?

4. If **YES** to # **1,** is the land currently under a Williamson Act contract?

   YES NO

5. If YES to # **1,** answer the following:

   Current land use
   Current zoning
   Current general plan designation

6. If YES to #1, is the land classified as Prime Farmland, Farmland *of* Statewide Importance **or** Unique Farmland **on** the Department **of** Conservation Important Farmland Maps?

   YES NO DON'T **KNOW**

7. If YES to # **1,** how many acres of land will be subject to physical change **or** land **use** restrictions under the proposal?

8. If **YES** to # **1,** is the property currently being commercially farmed **or** grazed?

   YES **NO**

9. If YES to **#8,** what are the number **of** employees/acre
   the total number **of** employees

10. Will the applicant acquire any interest in land under the proposal (**fee** title **or** a conservation easement)?

YES	**NO** ✓

11. What entity/organization will hold the interest?_____

12. If YES to # **10,** answer the following:

Total number of acres to be acquired under proposal	_____
Number **of** acres to be acquired in fee	_____
Number **of** acres to be subject to conservation easement	_____

13. For all proposals involving physical changes to the land **or** restriction in land use, describe what entity **or** organization will:

manage the property	_____
provide operations and maintenance semces	_____
conduct monitoring	_____

14. **For** land acquisitions (fee title or easements), will existing water rights also be acquired?

YES	NO

15. **Does** the applicant propose any modifications to the water right **or** change in the delivery **of** the water?

YES	**NO** ✓

16. **If YES** to # **15,** describe_____

Environmental Compliance Checklist

All applicants must fill **out** this Environmental Compliance Checklist. Applications must contain **answers** to the following **questions** to be responsive and ***to*** be considered for funding. ***Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.***

1. **Do** any of the actions included in the proposal require compliance with either the California Environmental Quality **Act** (CEQA), the National Environmental Policy Act (NEPA), or both?

   _____ **YES** ✓ NO

2. If you answered yes to # **1,** identify the lead governmental agency for CEQAINEPA compliance.

   _____
   Lead Agency

3. If you answered no to # **1,** explain why CEQAINEPA compliance is not required **for** the actions **in** the proposal.

   Categorically Exempt, Fisheries Research and Monitoring Project

4. **If** CEQA/NEPA compliance is required, describe how the project will comply with either or both **of** these laws. Describe where the project is in the compliauce.process and the expected date **of** completion.

5. Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?

   ✓ **YES**

   If yes, the applicant must attach written permission for access from the relevant property *owner(s).* Failure to include written permission for access may result in disqualification of the proposal during the review process. Research and monitoring field projects for which specific field locations have not been identified will be required to provide access needs and 'permissionfor access with *30* days **of** notification of approval.

   Exact sites not yet determined.

6. Please indicate what permits **or** other approvals **may** be required ***for*** the activities contained in **your** proposal. Check all boxes that apply.

LOCAL		
Conditional use permit	—	
Variance	—	
Subdivision Map Act approval	—	
Grading permit	—	
General plan amendment	—	
Specific plan approval	—	
Rezone	—	
Williamson Act Contract cancellation	—	
Other _____ (please specify)	—	
None required	✓	
STATE		
CESA Compliance	✓	(CDFG)
Streambed alteration permit	—	(CDFG)
CWA § **401** certification	—	(RWQCB)
Coastal development permit	—	(Coastal Commission/BCDC)
Reclamation Board approval	—	
Notification	—	(DPC, BCDC)
Other _____ (please specify)		
None required	—	
FEDERAL		
ESA Consultation	✓	**(USFWS)**
Rivers & Harbors Act permit	—	(ACOE)
CWA § **404** permit	—	(ACOE)
Other _____ (please specify)		
None required	—	

DPC = Delta Protection Commission
CWA = Clean Water Act
CESA = California Endangered Species Act
USFWS = U.S. Fish and Wildlife Service
ACOE = U.S. Army Corps of Engineers

ESA = Endangered Species Act
CDFG = California Department of Fish **and** Game
RWQCB = Regional Water Quality Control Board
BCDC = Bay Conservation and Development Comm.

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

2 DATE SUBMITTED: 15 May, 2000		Applicant Identifier
3. DATE RECEIVED BY STATE		State Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY		Federal Identifier

1. TYPE OF SUBMISSION

Application	Preapplication
☐ Construction	☐ Construction
☒ Non-Construction	☐ Non-Construction

5. APPLICANT INFORMATION

Legal Name: California Department of Fish & Game

Organizational Unit: Sac. Valley - Central Sierra Region

Address (give city, county, State, and zip code):

Name and telephone number of person to be contacted on matters involving this application (give area code): (916) 358-2945 Katherine Hill khill@dfg.ca.gov

6. EMPLOYER IDENTIFICATION NUMBER (EIN): ☐☐-☐☐☐☐☐☐☐

7. TYPE OF APPLICANT: (enter appropriate letter in box) A

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Learning
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify)

8. TYPE OF APPLICATION:

☒ New ☐ Continuation ☐ Revision

If Revision, enter appropriate letter(s) in box(es) ☐ ☐

A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other (specify):

9. NAME OF FEDERAL AGENCY:

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: XX-XXX

TITLE:

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: Butte Creek, Big Chico Creek and Sutter Bypass Chinook Salmon and Steelhead Evaluation

12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): Butte and Sutter Counties

13. PROPOSED PROJECT

Start Date	Ending Date
05/01	04/04

14. CONGRESSIONAL DISTRICTS OF

	a. Applicant	b. Project

15. ESTIMATED FUNDING:

a. Federal	$ .00
b. Applicant	$ .00
c. State	$ .00
d. Local	$ .00
e. Other	$ .00
f. Program Income	$ .00
g. TOTAL	$ 522,529 .00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO M ESTATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON .

DATE _____

b. NO. ☐ PROGRAM IS NOT COVERED BY E. 0.12372
☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?

☐ Yes If "Yes," attach an explanation. ☐ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Type Name of Authorized Representative	b. Title	c. Telephone Number
Katherine Hill	Associate Fishery Biologist	916-358-2945
Signature of Authorized Representative: Kathi L. Hill		e. Date Signed: 05/15/2000

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Standard Form 424 (Rev. 7-97)
Prescribed by OMB Circular A-102

INSTRUCTIONS FOR THE SF-424

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY;

This is a standard form used by applicants as a required facesheet for preapplications and applications submitted for Federal assistance. It will be used by Federal agencies to obtain applicant Certification that States which have established a review and comment procedure in response to Executive Order 12372 and have selected the program to be included in their process, have been given an opportunity to review the applicant's submission.

Item:	Entry:
1.	Self-explanatory.
2.	Date application submitted to Federal agency (or State if applicable) and applicant's control number (if applicable).
3.	State use only (if applicable).
4.	If this application is to continue or revise an existing award, enter present Federal identifier number. If for a new project, leave blank.
5.	Legal name of applicant, name of primary organizational unit which will undertake the assistance activity, complete address of the applicant, and name and telephone number of the person to contact on matters related to this application.
6.	Enter Employer Identification Number (EIN) as assigned by the Internal Revenue Service.
7.	Enter the appropriate letter in the space provided.
8.	Check appropriate box and enter appropriate letter(s) in the space(s) provided: – "New" means a new assistance award. – 'Continuation' means an extension for an additional funding/budget period for a project with a projected completion date. -- 'Revision' means any change in the Federal Government's financial obligation or contingent liability from an existing obligation.
9.	Name of Federal agency from which assistance is being requested with this application.
10.	Use the Catalog of Federal Domestic Assistance number and title of the program under which assistance is requested.
11.	Enter a brief descriptive title of the project. If more than one program is involved, you should append an explanation on a separate sheet. If appropriate (e.g., construction or real property projects), attach a map showing project location. For preapplications, use a separate sheet to provide a summary description of this project.

Item	Entry:
12.	List only the largest political entities affected (e.g., State, counties, cities).
13.	Self-explanatory.
14.	List the applicant's Congressional District and any District(s) affected by the program or project.
15.	Amount requested or to be contributed during the first funding budget period by each contributor. Value of in-kind contributions should be included on appropriate lines as applicable. If the action will result in a dollar change to an existing award, indicate *only* the amount of the change. For decreases, enclose the amounts in parentheses. If both basic and supplemental amounts are included, show breakdown on an attached sheet. For multiple program funding, use totals and show breakdown using same categories as item 15.
16.	Applicants should contact the State Single Point of Contact (SPOC) for Federal Executive Order 12372 to determine whether the application is subject to the State intergovernmental review process.
17.	This question applies to the applicant organization, not the person who signs as the authorized representative. Categories of debt include delinquent audit disallowances, loans and taxes.
18.	To tie signed by the authorized representative of the applicant. A copy of the governing body's authorization for you to sign this application as official representative must be on file in the applicant's office. (Certain Federal agencies may require that this authorization be submitted as part of the application.)

BUDGET INFORMATION - Non-Construction Programs

OMB Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		$	$	$	$	$
2.						
3.						
4.						
5. Totals		$	$	$	$	$

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
a. Personnel	$	$	$	$	$
b. Fringe Benefits	See Table 1 of Proposal				
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges *(sum of 6a-6h)*					
j. Indirect Charges					
k. TOTALS *(sum of 6i and 6j)*	$	$	$	$	$ 522,529
7. Program Income	$	$	$	$	$ 0

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Standard Form 424A (Rev. 7-97)

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
0.	$	$	$	$
9.				
10.				
11.				
12. TOTAL *(sum of lines 8-11)*	$	$	$	$522,529

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	41h Quarter
13. Federal	$	$	$	$	$
14. Non-Federal					
15. TOTAL *(sum of lines 13 and 14)*	$ 164,658	$ 40,000	$ 40,000	$ 44,658	$ 40,000

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	$	$	$	$
17.				
18.				
19.				
20. TOTAL *(sum of lines 16-19)*	$ 164,658	$ 173,996	$ 183,875	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges:	22. Indirect Charges:
23. Remarks:	

OMB Approval No. 0348-0040

"ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further. certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion .of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, .the State, through any authorized representative. access to and the right to examine all records, books, papers, or documents related to the award; and. will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmenial Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255). as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.). as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of atiy other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III .of ,the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property' is acquired as a result of Federal or federally-assistedprograms. These requirements apply to all interests in real property acquired'for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose 'principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in Roodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, 'Audits of States, Local Governments, and Non-Profit Organizations.'

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations. and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Kathie A. Hill	Associate Fishery Biologist
APPLICANT ORGANIZATION	DATE SUBMITTED
California Department of Fish & Game	05/15/00

Standard Form 424B (Rev. 7-97) Back

OMB Approval No. 0348-0042

ASSURANCES - CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the Awarding Agency. Further, certain Federal assistance awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance, and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project costs) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptrolier General of the United States and, if appropriate, the State, through any authorized representative, access to .and the right to examine all records, books, papers, or documents related to the assistance; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will not dispose of, modify the use of, or change the terms of the real property title, or other interest in the site and facilities without permission and instructions from the awarding agency. Will record the Federal interest in the title of real property in accordance with awarding agency directives and will include a covenant in the title of real property aquired in whole or in part with Federal assistance funds to assure non-discrimination during the useful life of the project.

4. Will comply with the requirements of the assistance awarding agency with regard to the drafting, review and approval of construction plans and specifications.

5. Will provide and maintain competent and adequate engineering supervision at the construction site to ensure that the complete work conforms with the approved plans and specifications and will furnish progress reports and such other information as may be required by the assistance awarding agency or State.

6. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

7. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest. or personal gain.

8. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

9. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

10. Will comply with all Federal statutes relating to non-discrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin: (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681 1683, and 1685-1686), which prohibits discrimination on the basis of sex: (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age: (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse: (9 the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis .of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records: (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing: (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

11. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal and federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

12. Will comply with the provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

13. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333) regarding labor standards for federally-assisted construction subagreements.

14. Will comply with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

15. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

16. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

17. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

18. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, 'Audits of States, Local Governments, and Non-Profit Organizations.'

19. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Katherine A Hill	Associate Fishery Biologist
APPLICANT ORGANIZATION	**DATE SUBMITTED**
CA Dept Fish & Game	05/15/00

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK __ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL.

Alternate I. (Grantees Other Than Individuals).

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution; dispensing, possession, or use. of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about--
(1) The dangers of drug abuse in the workplace:
(2) The grantee's policy of maintaining a drug-free workplace;
(3) Any available drug counseling, rehabilitation, and employee assistance programs; and
(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of'the statement required by paragraph (a);

(dI Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
(1) Abide by the terms of the statement; and
(2) Notify the employer in writing of his or her,conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employersof convicted employees must provide notice, including positiontitle, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the ieceipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted --
(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1.973, as amended; or
(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Check __ if there are workplaces on file that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK __ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (GranteesWho Are Individuals)

(a) The grantee certifies that, as a condition of the grant, tie or she will not engage in the unlawful manufacture, distribution. dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

(b) If convicted of a criminalbrug offense resulting from a violation occurring during the conduct of any grant activity. he .or she will report the conviction, in writing, within 10 calendar days of the conviction, to the grant officer or other designee, unless the Federal agency.designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submining this proposalthat it will includethe clausetitled. "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign; or use Department of the Interior Form 1954 (Dl-19541. (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibilityand Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals)- (See Appendix C of Subpart D of 43 CFR Part 12.)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

CHECK__ IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge a'nd belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, anempting to obtain, or performing a public (Federal, State or local) transaction orcontract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with cornmission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this applicationlproposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

CHECK__ IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal. that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification. such prospective participant shall anach an explanation to this proposal.

Dl-2010
March 1995
(This form consolidates Dl-1953, Dl-1954. Dl-1955. Dl-1956 and 01-19631

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK __ IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT, SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK __ IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency. a Member of Congress. and officer or employee of Congress. or an employee of a Member of Congress in connection with the awarding of any Federal contract. the making of any Federal grant. the making of any Federal loan. the entering into of any cooperative agreement, and the extension. continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency. a ,Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that **all** subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section **1352,** title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL Katherine A. Hill

TYPED NAME AND TITLE Katherine A. Hill

DATE 05/15/00

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

BUTTE CREEK SPRING-RUN CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, JUVENILE OUTMIGRATION AND LIFE HISTORY 1995-1998

by

Katherine A. Hill
and
Jason D. Webber
Sacramento Valley and Central Sierra Region

Inland Fisheries

Administrative Report No. 99-5

1999

BUTTE CREEK SPRING-RUN CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, JUVENILE OUTMIGRATION AND LIFE HISTORY 1995-1998[1/]

by

Katherine A. Hill
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Jason D. Webber
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ABSTRACT

This report covers juvenile chinook salmon, ***Oncorhynchus tshawytscha***, monitoring in Butte Creek from October, 1995 until July, 1998. Fish were trapped in Butte Creek at sites near Chico, California (Butte County) and Sutter Bypass/Lower Butte Creek, West Borrow (Sutter County).

For the 1995/1996 sampling year, 119,788 juvenile chinook salmon were captured at the Chico site and 52,284 at the Sutter Bypass site. Of the 119,788 captured near Chico, 14,452 were coded-wire tagged. Fifty-nine of the tagged salmon were recaptured at the Sutter Bypass site trap.

For the 1996/1997 sampling period, 1,922 juvenile chinook salmon were captured at the Chico site and 111 at the Sutter Bypass site. Of the 1,922 captured near Chico, 449 were coded-wire tagged. None of the tagged salmon was recaptured.

For the 1997/1998 sampling period, 10,583 juvenile chinook salmon were captured at the Chico site and 15,480 at the Sutter Bypass site. Of the 10,583 captured near Chico, 3,408 were coded-wire tagged. Five of the tagged salmon were recaptured at the Sutter Bypass site trap.

Yearling salmon were captured at the uppermost trapping site near Chico in October. Young-of-the-year were captured as early as mid-November. Virtually all juvenile salmon had left the Sutter Bypass by mid-May.

Adult escapement of Butte Creek spring-run chinook salmon was determined by snorkel survey. Escapement estimates for 1995, 1996, and 1997 were 7,480, 1,400, and 635 fish, respectively. All escapements were higher than the average escapement of 461 fish from 1967 to 1994.

1/ Inland Fisheries Administrative Report No. 99-5. Edited by M. Ralph Carpenter, Sacramento Valley and Central Sierra Region, 1701 Nimbus Road, Suite A, Rancho Cordova, California 95670. This study was funded by the Federal Aid in Sport Fish Restoration Program, California Grant No. F-51-R-11, Project 20, Job 1 and the Central Valley Anadromous Fish Restoration Program.

INTRODUCTION

Spring-run chinook salmon (SRCS), *Oncorhynchus tshawytscha*, are listed as threatened under the California Endangered Species Act. Butte Creek is one of only *three* streams that form a basis for population trends of SRCS in the Central Valley of California Nearby Mill and Deer creeks are the other two streams. The Butte Creek SRCS escapement for the years 1967 to 1994 averaged 461 fish and ranged fiom 10 fish in 1979 to 2,384 fish in 1989 (California Department of Fish and Game [CDFG], 1998). The adult escapement is used to indicate population trends for Butte Creek SRCS. The recovery status of SRCS is determined, in part, by escapement trend. The adult escapement was estimated for 1995 through 1997.

In general, SRCS in Butte Creek display the following life *history* pattern. Fish enter fresh water starting in February, *ending* in June. They enter Butte Creek from late February through June. SRCS are sexually immature when they enter fresh water. They hold in deep pools during the summer. Their gonads mature during the summer holding period and spawning begins in late September when stream temperatures cooL Emergence occurs as early as late November, but emergence time is a function of water temperature. From observation and inference, most SRCS emigrate from Butte Creek as fry (young-of-the-year [YOY]) but some emigrate as yearlings. Yearlings are juvenile SRCS that remain in the stream, oversummer, and emigrate in the fall, usually in October after enough rain has fallen to provide transport. The disposition of these fish, after they exit the spawning area, is loosely defined. SRCS leave upper Butte Creek either through Butte Slough Outfall or through Sutter Bypass to the Sacramento River through the Delta before they enter saltwater.

To better define the juvenile life history of Butte Creek SRCS, this study 1) monitored outmigration timing and relative abundance of age 0+ juvenile SRCS within Butte Creek, including Sutter Bypass, and as they entered the mainstem Sacramento River, 2) documented the outmigration of yearling SRCS, and 3) documented growth ofjuvenile SRCS in the Butte Creek system, including the Sutter Bypass, through coded-wire tagging ofjuvenile salmon at Parrott-Phalen Diversion Dam (PPDD) and Adams Dam. Through the efforts of other researchers, coded-wire tagged Butte Creek SRCS juveniles will be tracked as they emigrate downstream through the mainstem Sacramento River and the Delta- Tagged salmon will also be recovered in the ocean fishery to determine how and where Butte Creek SRCS contribute to the ocean harvest.

Butte Creek Watershed and Hydrology

The Butte Creek watershed is approximately 390 km^2 and is Iocated in the northeast portion of Butte County. The headwaters of Butte Creek are in Lassen National Forest. Butte Creek enters the mainstem Sacramento River at two locations, the Butte Slough outfall gates and the downstream end of the Sutter Bypass near the confluence of the Feather River with the Sacramento River (Figure 1). When flows are greater than 21,000 ft^3 per second (cfs) at Wilkins Slough in the Sacramento River, part of the Sacramento River flows into lower Butte Creek and the Sutter Bypass through the Tisdale Weir. Moulton and Colusa weirs are upstream of Tisdale

Weir and are staged to spill when the flow at Ord Bend reaches 45,000 cfs and 65,000 cfs, respectively (Paul Ward, CDFG, pers. comm.). The capacity of the Sacramento River channel downstream of the Tisdale Weir at Wilkins Slough is 30,000 cfs. These weirs have a combined capacity to pass 133,000 cfs into the Sutter Bypass (Dept. of the Army, 1975). When water is bypassed, outmigrating salmonids fkom upstream of the Sutter Bypass mix with SRCS from Butte Creek.

MATERIALS AND METHODS

Trapping Sites

Fish were trapped at three locations along Butte Creek (Figure 1). The PPDD is the uppermost site. The site is immediately downstream of the SRCS holding and spawning area and upstream of where fall-run chinook salmon spawn, although on occasion some fall-run chinook salmon spawn above PPDD. Adams Dam is approximately 11 km downstream of PPDD, both sites are near Chico, California. The Sutter Bypass West Borrow Weir 1 is adjacent to the Sutter National Wildlife Refuge approximately 98 km downstream of PPDD near Yuba City, California. Each site was sampled with a 2.4 m (8 ft) rotary screw trap with a live box 1.2 m x 1.2 m x 0.9 m (4 ft x 4 ft x 3 ft) manufactured by EG Solutions (Eugene, Oregon). In addition to the screw trap at PPDD, the diversion canal bad an off-stream fish screen outfitted with a trap box 1.2 m x 0.9 m x 2.1 m (4 ft x 3 ft x 7 ft) used to trap fish. Steel cable 0.6 cm (1/4 in.) in diameter connected the screw trap to the dam or another upstream stationary object. Placement was adjusted regularly based on water flow; typically with higher flows the trap was moved away from the dam allowing safer operation and access. All traps were fished 24 h a day, seven days a week, except during extraordinarily high water flows or during periods of excessive debris.

Processing Captured Fish

All fish were netted from the live-boxes and immediately placed into a shallow tub of fresh river water. Juvenile chinook salmon were sorted from other species and transferred swiftly with small aquarium nets into buckets equipped with portable aerators to be transported to shore for processing. The first 10 of each non-salmon fish species were measured to the nearest mm fork length (FL) and released. The remainder were counted and released. Other species captured were recorded (Appendices D and E).

A sub-sample of 50 salmon juveniles was placed into a bucket containing a weak, standardized solution of tricaine methanesulfonate (MS-222) and anaesthetized (6.3 g of MS-222 powder are dissolved m 1 liter of fresh distilled water to create a stock solution, which is then used at a dilution of 8-9 ml stock solution/1 liter of fresh river water). Upon immobilization, the juveniles were individually placed onto a wetted plexiglass measuring board and measured to the nearest mm FL. Thirty of this group were then transferred to a wetted container on an Ohaus electronic scale and weighed to the nearest 0.01 g. All salmon caught in the Sutter Bypass trap were

examined for an *adipose* fin clip. Salmon with a clipped adipose fin were sacrificed and preserved for future coded-wire tag (CWT) recovery and decoding. Each fish was individually bagged and given a tag having a unique numeric code identifying the date of capture, fork length and capture location Unclipped fish were poured into a bucket of fresh aerated river water for recovery. After full recovery, all unmarked salmon were released downstream of the trap.

Juvenile chinook salmon were tagged adjacent to the PPDD trapping site. A sample of the salmon (up to 5,000) caught each day was put into a net holding pen (1.2 m^3,(4 ft^3) with 0.32 cm, (1/8 in.) mesh) near the diversion trap for future tagging. Holding time ranged from 2-10 d, depending on processing time and the number of fish *being* caught at any one time.

Fish were tagged using a Northwest Marine Technology Tag Injector Model MKII and Model MKII Quality Control Device (QCD). Injectors were fitted with a 1,200 fish/lb head mold and injected half-length (0.5 mm) *binary* coded-wire tags. Fish were anaesthetized in MS-222, adipose fin clipped, then tagged in the rostrum and placed through the QCD. All but a group of 100 tagged fish were recovered in fresh water and released. The remaining fish were held for 24 hours and re-run through the QCD to obtain a 24–hour tag *shedding* rate and then released. Yearling salmon and late-falljuveniles were not included in the sample tagged, except in 1996 when a group of 20 yearlings was tagged. Tag codes were changed periodically through the outmigration period.

Juvenile Outmigration

Yearling SRCS are determined by examining length-frequency distributions of salmon trapped at PPDD or Adams Dam. These fish are the only salmon that emigrate in the fall before fish from the newly spawned brood year emerge. When both year classes are *in* the stream, the yearlings appear much larger than YOY.

Outmigration of YOY SRCS is desmid by examining catches of salmon trapped at PPDD, Adams Dam and from tagged fish recovered in the Sutter Bypass.

Growth

Information from tagged salmon recoveries at the Sutter Bypass site was used to determine how long juvenile salmon remained in the system and to make a preliminary estimate of growth expressed in millimeters per day. The mean FL was calculated for each tag group. Because the release of a tag code covered a varying number of days, the median release date was used €or calculating mean growth. Growth was determined by subtracting 'themean release size from the individual capture size. Growth rate was calculated by dividing the difference between mean size at release ($FL_{Release}$) and *size* at recovery ($FL_{Recovery}$) by the difference in the number of days (d) between median release date and recovery date ($FL_{Recovery}$-$FL_{Release}$/$d_{Recovery-Release}$).

Relative Abundauce

Relative abundance will be measured by comparing catches at PPDD for the 1995,1996, and 1997 brood years.

Adult Escapement

Each year's adult count was determined by snorkel survey. The entire known spring-run salmon holding habitat was surveyed. The holding habitat is from Quartz Bowl 1 km downstream of the Centerville Head Dam downstream to PPDD, which is approximately 16.9 km or 10.5 miles. Surveys were conducted each August, while SRCS adults were holding in pools. Three to five experienced personnel swam abreast downstream through pools counting adult salmon. At the end of the pool, each person would state their figure and whether it was a count or an estimate. If there was a greater than 20% discrepancy between the counts, the pool would be surveyed again until greater precision was obtained. If there was less than 20% discrepancy, all counts were recorded with the lowest values and highest values for all pools summed for reporting a minimum and maximum range of total escapement. Counts were used for most pools, but estimates were used when the number of salmon in a pool precluded an actual count. The sum of the maximum count or estimate was used as an escapement estimate. The same individuals conducted the week-long survey.

RESULTS

1995-1996 Trapping Season

Fish capture for the 1995-1996 sampling year began 28 November 1995 at the PPDD site, when the diversion screen trap was installed. The screw trap was installed on 1 December 1995. Both traps were fished (when stream flow permitted) until April 29, 1996, when the screw trap was removed due to a high volume of debris at the trapping site. An eddy had formed during high flows which gathered debris and directed it into the entrance of the trap. The diversion screen trap was fished until 8 July 1996. A total of 119,788 juvenile chinook salmon was captured in both traps — 38,149 in the diversion screen trap and 81,639 in the screw trap (Tables 1-3). Of the total captured, 14,452 were tagged and released (Table 4). Since the diversion screen trap is located off-stream in the diversion canal, the trapping data indicate conclusively the benefit of the PPDD fish screen; any fish captured in the trap would have been lost into the canal if there was no fish screen.

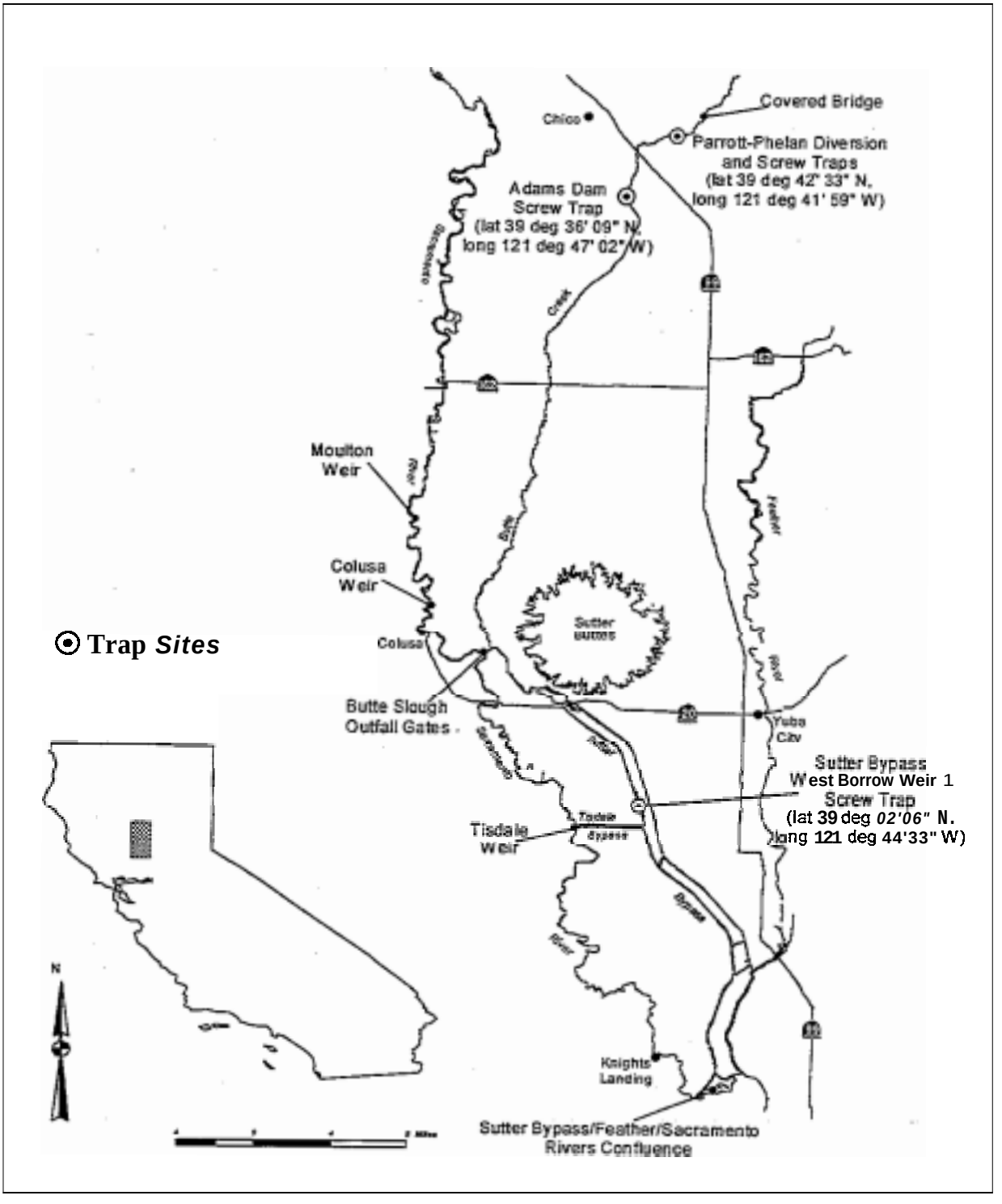

FIGURE 1. Butte Creek **watershed** indicating **trapping sites.**

TABLE 1. Bi-weekly catch summary of spring-run chinook salmon fishing the screen trap at Parrott-Phelan Diversion Dam from 28 November 1995 to 8 July 1996; yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
11/28/95	11/30/95	35	1.4	33	39	47	2
12/1/95	12/15/95	35	1.3	30	39	2,247	12
12/16/95	12/31/95	35	1.2	32	41	4,238	13
1/1/96	1/15/96	36	1.6	30	53	19,536	15
1/16/96	1/31/96	36	2.7	34	61	10,366	5
2/1/96	2/15/96	37	2.8	31	51	964	9
2/16/96	2/29/96	41	8.8	32	79	201	6
3/1/96	3/15/96	51	6.5	40	63	12	9
3/16/96	3/31/96	56	10.9	42	90	20	14
4/1/96	4/15/96	61	6.0	52	75	29	12
4/16/96	4/30/96	75	8.8	56	92	60	11
5/1/96	5/15/96	86	10.2	50	116	247	12
5/16/96	5/31/96	75	15.6	50	107	26	12
6/1/96	6/15/96	72	11.6	55	103	32	15
6/16/96	6/30/96	74	4.7	67	85	18	15
7/1/96	7/8/96	81	-	81	81	1	8
					Total:	38,044	170

TABLE 2. Si-weekly catch summary of spring-run chinook salmon fishing the screw trap at Parrott-Phelan Diversion Dam from 1 December 1995 to 29 April 1996; yearling captures are excluded.

Trapping period		MeanFL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
12/1/95	12/15/95	35	1.1	31	38	3,742	12
12/16/95	12/31/95	35	1.7	26	51	6,518	10
1/1/96	1/15/96	36	2.3	32	53	44,937	15
1/16/96	1/31/96	36	1.3	32	43	18,420	8
2/1/96	2/15/96	36	4.1	33	60	7,583	3
2/16/96	2/29/96	36	4.5	31	60	74	3
3/1/96	3/15/96	63	9.9	56	70	2	1
3/16/96	3/31/96	59	13.3	40	91	49	16
4/1/96	4/15/96	76	10.5	52	101	92	15
4/16/96	4/29/96	81	11.6	57	113	53	14
					Total:	81,470	97

TABLE 3. Bi-weekly catch summary of spring-run chinook salmon combining the effort of the screen trap and the screw trap at Parrott-Phelan Diversion Dam from 28 November 1995 to 8 July 1996; yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL mm		Total no. tured	No. trapping das
11/28/95	11/30/95	35	1.4	33	39	47	2
12/1/95	12/15/95	35	1.2	30	39	5,989	12
12/16/95	12/31/95	35	1.5	26	51	10,756	13
1/1/96	1/15/96	36	2.0	30	53	64,473	15
1/16/96	1/31/96	36	1.8	32	61	28,786	10
2/1/96	2/15/96	37	3.3	31	60	8,547	9
2/16/96	2/29/96	40	8.1	31	79	275	6
3/1/96	3/15/96	53	7.8	40	70	14	9
3/16/96	3/31/96	58	12.7	40	91	69	16
4/1/96	4/15/96	73	11.5	52	101	121	15
4/16/96	4/30/96	77	10.5	56	113	113	14
5/1/96	5/15/96	86	10.2	50	116	247	12
5/16/96	5/31/96	75	15.6	50	107	26	12
6/1/96	6/15/96	72	11.6	55	103	32	15
6/16/96	6/30/96	74	4.7	67	85	18	15
7/1/96	7/8/96	81	-	-	-	1	8
					Total:	119,514	183

TABLE 4. Summary of coded-wire tagged spring-run chinook salmon released at Parrott-Phelan Diversion Dam from 4 January 1996 to 5 June 1996.

Tag code	Release date range		Mean FL (m)	Range FL (m)		Total no. released
B6-12-01	1/4/96	1/25/96	36	30	53	6,598
B6-12-02	1/25/96	3/16/96	37	31	79	7,393
B6-12-03	3/22/96	4/7/96	65	41	95	85
B6-12-04	4/8/96	4/29/96	76	52	113	165
B6-12-05	5/4/96	6/5/96	84	50	116	211

Approximately 93,000 (78 %) juvenile SRCS (Table 3) of the entire salmon catch occurred during January 1996. Trapping had to be suspended for various periods of time (Tables 1 and 2) because of high flows (Appendix A, Figure 1).

The Sutter Bypass sampling began 16 January 1996 in the Sutter Bypass at Weir 1, West Borrow. The Bypass was flooded and water was slack for most of the time period between trap installation and 15 March 1996, so trapping was not possible for much of the time. As the flood waters began to recede in mid-March, salmon captures increased significantly. From 16 March 1996 to 31 March 1996, the trap was fished only during the day to avoid fish mortality, therefore the reported 22,793 total salmon captured is deceptively low; a significantly larger number would have been caught if the trap had fished 24 h/d. The first CWT recapture was on 21 March 1996, the last on 19 May 1996 (Table 6). One fish with tag code B6-12-04 was recovered at 96 mm FL. Two fish were recovered with tag code B6-12-05 at 95 mm FL and 87 mm FL. Of 61 CWT recaptures from the Sutter Trap, 59 were Butte Creek SRCS and two were from Coleman National Fish Hatchery (CNFH) (one fall-run and one winter-run chinook salmon).

TABLE 5. Bi-weekly catch summary of juvenile chinook salmon fishing a screw trap in the Sutter Bypass at West Borrow Weir 1 from 16 January 1996 to 8 July 1996. Fish captured at this location cannot be identified as spring-run chinook salmon because of the mixing of juvenile salmon of other races from the Sacramento River.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
1/16/96	1/31/96	42	12.1	32	98	92	4
2/1/96	2/15/96	50	19.9	30	171	1,545	13
2/16/96	2/29/96	50	15.5	32	128	142	9
3/1/96	3/15/96	76	22.0	32	133	926	15
3/16/96	3/31/96*	90	13.6	36	134	22,793	13
4/1/96	4/15/96	87	10.6	36	125	14,407	15
4/16/96	4/30/96	91	9.6	62	124	7,669	15
5/1/96	5/15/96	87	8.6	55	127	4,143	15
5/16/96	5/31/96	86	8.7	57	116	555	14
6/1/96	6/15/96	86	9.9	76	104	9	15
6/16/96	6/30/96	103	28.3	84	145	4	15
7/1/96	7/8/96	-	-	-	-	0	8
					Total:	52,285	151

* Trap fished only during daylight hours.

TABLE 6. **Recaptures of spring-run chinook** salmon bearing coded-wire. **tags in the Sutter** Bypass **West Borrow Weir** 1. *All fish* **were tagged at Parrott-Phelan** Diversion Dam. **All fish were** fiom **the 1995** brood **year.**

Tag code B6-12-01

Recovery date	Recovery FL (mm)	d at large	mm/d
3/21/96	96	67	0.90
3/21/96	91	67	0.82
3/22/96	80	68	0.65
3/22/96	85	68	0.72
3/23/96	88	69	0.75
3/29/96	85	75	0.65
3/29/96	73	75	0.49
3/29/96	73	75	0.49
4/7/96	95	84	0.70
4/7/96	98	84	0.74
4/9/96	91	86	0.64
4/9/96	90	86	0.63
4/9/96	93	86	0.66
4/9/96	91	86	0.64
4/10/96	90	87	0.62
4/11/96	97	88	0.69
4/11/96	84	88	0.55
4/11/96	79	88	0.49
4/12/96	87	89	0.57
4/13/96	80	90	0.49
4/14/96	89	91	0.58
4/15/96	87	92	0.55
4/15/96	85	92	0.53
4/16/96	78	93	0.45
4/18/96	108	95	0.76
4/18/96	92	95	0.59
4/18/96	105	95	0.73

TABLE *6* (continued). Recaptures of spring-run chinook salmon bearing coded-wire *tags* in the Sutter Bypass West Borrow Weir 1. All fish were tagged at Parrott-Phelan Diversion Dam All fish were from the 1995 brood year.

Tag code B6-12-02

Recovery date	Recovery FL (mm)	d at large	mm /d
3/29/96	67	37	0.81
3/29/96	68	37	0.84
4/1/96	77	40	1.00
4/6/96	83	45	1.02
4/7/96	89	46	1.13
4/9/96	89	48	1.08
4/9/96	78	48	0.85
4/9/96	86	48	1.02
4/10/96	83	49	0.94
4/10/96	84	49	0.96
4/10/96	80	49	0.88
4/10/96	69	49	0.65
4/11/96	83	50	0.92
4/11/96	89	50	1.04
4/12/96	92	51	1.08
4/14/96	82	53	0.85
4/14/96	76	53	0.74
4/15/96	85	54	0.89
4/15/96	90	54	0.98
4/16/96	90	55	0.96
4/16/96	85	55	0.87
4/16/96	87	55	0.91
4/18/96	95	57	1.02
4/21/96	105	60	1.13
4/22/96	79	61	0.69
4/27/96	92	66	0.83
4/29/96	78	68	0.60
4/29/96	90	68	0.78
5/19/96	113	88	0.86

TABLE 7. Recaptures of spring-run chinook salmon bearing coded-wire tags from Sherwood Harbor (Sacramento, California), Chipps Island (near Pittsburg, California), and Walnut Grove, California All fish were tagged at Parrott-Phelan Diversion Dam All fish were fiom the 1995 brood year.

Tag code	Recovery date	Recovery FL (mm)	mm/d	Recapture location	d at large
B6-12-01	4/2/96	91	0.47	Sherwood H.	79
B6-12-02	4/3/96	77	0.95	walnut Gr.	42
B6-12-02	4/8/96	78	0.87	walnut Gr:	47
B6-12-02	4/9/96	77	0.83	walnut Gr.	48
B6-12-02	5/8/96	95	0.75	Chipps Is.	77

1996-97 Trapping Season

Fish capture for the **1996-1997** sampling year began **17** September **1996** at the PPDD site, when the diversion trap was installed. The screw trap was installed on 20 September **1996.** Both traps were fished until **28** December **1996** when both traps were pulled due to very **high** flow. **A** total of **1,860** SRCS fry was captured

On 1 January **1997,** flow *in* **Butte Creek** reached a record **26,600** cfs (Appendix **A,** Figure 2). Significant damage was done to the diversion structure and to the fish ladder. The creek moved fiom the channel during the night of 1 January **and** left the diversion structure, fish ladder and both fish traps hundreds of meters from the old channel.

On 17 January **1997** a screw trap was installed **at Adams** Dam and was fished until **26** June 1997. Neither PPDD trapping sites could be utilized until the following sampling year when the creek was moved back to its original channel. **A** total of 32 juvenile salmon was captured; none was tagged.

TABLE 8. Bi-weekly catch *summary* of spring-m chinook saimon **fishing the screen** trap *at* **Parrott-Phelan Diversion Dam** from **17 September 1996 to 31 December 1996;** yearling **captures are excluded.**

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. tapping days
9/17/96	9/30/96	-	-	-	-	0	13
10/1/96	10/15/96	-	-	-	-	0	15
10/16/96	10/31/96	-	-	-	-	0	16
11/1/96	11/15/96	-	-	-	-	0	15
11/16/96	11/30/96	32	1.3	30	34	16	15
12/1/96	12/15/96	35	2.1	29	41	694	10
12/16/96	12/31/96	35	1.6	28	39	391	12
					Total:	1,101	96

TABLE 9.' Si-weekly catch summary of spring-run chinook salmon fishing the screw trap at Parrott-Phelan Diversion Dam from 20 September 1996 to 31 December 1996; yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
9/20/96	9/30/96	-	-	-	-	0	10
10/1/96	10/15/96	-	-	-	-	0	15
10/16/96	10/31/96	-	-	-	-	0	15
11/1/96	11/15/96	-	-	-	-	0	15
11/16/96	11/30/96	32	1.8	29	37	32	15
12/1/96	12/15/96	34	1.4	31	38	278	8
12/16/96	12/31/96	35	1.6	25	40	449	7
					Total:	759	85

TABLE 10. Si-weekly catch summary of spring-run chinook salmon fishing the screw trap at Adams Dam from 16 January 1997 to 26 June 1997; yearling captures are excluded.

Trapping nod		Mean FL mm)	Standard deviation	e FL mm		Total no. ca tured	No. trapping days
1/16/97	1/31/97	37	-	37	37	1	6
2/1/97	2/15/97	-	-	-	-	0	12
2/16/97	2/28/97	-	-	-	-	0	13
3/1/97	3/15/97	-	-	-	-	0	14
3/16/97	3/31/97	-	-	-	-	0	13
4/1/97	4/15/97	92	7.9	74	101	9	15
4/16/97	4/30/97	82	9.7	67	108	22	12
5/1/97	5/15/97	-	-	-	-	0	15
5/16/97	5/31/97	-	-	-	-	0	16
6/1/97	6/15/97	-	-	-	-	0	15
6/16/97	6/26/97	-	-	-	-	0	11
					Total:	32	142

Sampling began on 20 March 1997 at Weir 1 in the Sutter Bypass. *Sampling* was suspended on 24 March after only 4 days because several winter-run sized salmon[2/] had been captured. A winter-run chinook salmon take permit application had been submitted to National Marine Fisheries Service but had not yet been approved. Of the 111 salmon captured, none was marked.

TABLE 11. Bi-weekly catch *summary* of spring-run chinook salmon combining the effort of the screen trap and the screw trap at Parrott-Phelan Diversion Dam and Adams Dam from 17 September 1996 to 26 June 1997; yearling captures are excluded.

Trapping period		MeanFL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
9/17/96	9/30/96	-	-	-	-	0	13
10/1/96	10/15/96	-	-	-	-	0	15
10/16/96	10/31/96	-	-	-	-	0	16
11/1/96	11/15/96	-	-	-	-	0	15
11/16/96	11/30/96	32	1.6	29	37	48	15
12/1/96	12/15/96	35	1.9	29	41	972	11
12/16/96	12/31/96	35	1.6	25	40	840	12
1/1/97	1/15/97	-	-	-	-	-	0
1/16/97	1/31/97	37	-	-	-	1	6
2/1/97	2/15/97	-	-	-	-	0	12
2/16/97	2/28/97	-	-	-	-	0	13
3/1/97	3/15/97	-	-	-	-	0	14
3/16/97	3/31/97	-	-	-	-	0	13
4/1/97	4/15/97	92	7.9	74	101	9	15
4/16/97	4/30/97	82	9.7	67	108	22	12
5/1/97	5/15/97	-	-	-	-	0	15
5/16/97	5/31/97	-	-	-	-	0	16
6/1/97	6/15/97	-	-	-	-	0	15
6/16/97	6/26/97	-	-	-	-	0	11
					Total:	1,892	239

TABLE 12. Summary of coded-wire tagged spring-run chinook salmon released at Parrott-Phelan Diversion Dam from 12 October 1996 to 21 December 1996.

Tag code	Release date range		MeanFL (mm)	Range FL (mm)		Total no. released
06-01-12-01-11	12/8/96	12/18/96	35	29	39	429
06-01-08-05-05*	10/12/96	12/21/96	114	92	144	20

*Yearlings; all others sub-yearlings

[2/] F. Fisher. 1992. chinook *salmon, Oncorhynchus tshawytscha,* growth and occurrence in the Sacramento-San Joaquin river system. CDFG, Inland Fisheries Division, Red Bluff, California manuscript, 42 p.

TABLE 13. Si-weekly catch summary of juvenile chinook salmon fishing the screw trap in Sutter Bypass at West Borrow Weir 1 from 21 March 1997 to 24 March. Fish captured here can not be identified as spring-run chinook salmon because of the *mixing* of juvenile salmon of other races from the Sacramento River.

Trapping period		MeanFL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
3/21/97	3/24/97	81	10.8	57	110	111	4
					Total:	111	4

1997-98 Trapping Season

Sampling for the 1997-1998 sampling began *6* October 1997 at the PPDD site, when the diversion screen trap was installed. The screw trap was installed on 20 October 1997. Both traps were fished until 11 January 1998 when a large storm clogged the ladder with debris and blocked flow to the screw trap. The ladder obstruction was cleared and trapping resumed 5 March 1998. A total of 8,808 juvenile SRCS was captured (Tables 14 through 17). Of *that* total, 3,408 were coded-wire tagged (Table 18).

TABLE 14. Bi-weekly catch summary *of* spring-run chinook salmon fishing the screen trap at Parrott-Phelan Diversion Dam from *6* October 1997 to 23 July *1998;* yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
10/6/97	10/15/97	-	-	-	-	0	9
10/16/97	10/31/97	-	-	-	-	0	16
11/1/97	11/15/97	-	-	-	-	0	15
11/16/97	11/30/97	31	2.2	28	34	10	12
12/1/97	12/15/97	34	1.9	28	37	74	15
12/16/97	12/31/97	35	1.2	30	37	76	15
1/1/98	1/15/98	35	1.6	31	40	1,865	9
1/16/98	1/31/98	35	1.8	30	45	206	15
2/1/98	2/15/98	34	1.2	33	36	12	9
2/16/98	2/28/98	39	-	-	-	1	13
3/1/98	3/15/98	-	-	-	-	0	15
3/16/98	3/31/98	-	-	-	-	0	13
4/1/98	4/15/98	-	-	-	-	0	14
4/16/98	4/30/98	90	3.5	87	92	2	15
5/1/98	5/15/98	67	10.6	54	83	8	14
5/16/98	5/31/98	72	10.5	52	91	35	13
6/1/98	6/15/98	80	4.2	75	83	4	15
6/16/98	6/30/98	83	3.5	78	86	4	15
7/1/98	7/15/98	-	-	-	-	0	15
7/16/98	7/23/98	-	-	-	-	0	8
					Total:	2,297	265

TABLE 15. Bi-weekly catch *summary* of spring-run chinook salmon fishing the screw trap at Parrott-Phelan Diversion Dam from 20 October 1997 to 23 July 1998; yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. trapping days
10/20/97	10/31/97	-	-	-	-	0	11
11/1/97	11/15/97	-	-	-	-	0	15
11/16/97	11/30/97	31	1.6	29	33	6	12
12/1/97	12/15/97	34	1.7	31	38	74	15
12/16/97	12/31/97	35	1.0	31	38	251	16
1/1/98	1/15/98	36	1.6	31	39	5,171	8
1/16/98	1/31/98	-	-	-	-	-	0
2/1/98	2/15/98	-	-	-	-	-	0
2/16/98	2/28/98	-	-	-	-	-	0
3/1/98	3/15/98	53	7.4	43	61	123	7
3/16/98	3/31/98	69	11.2	50	86	71	12
4/1/98	4/15/98	73	16.4	49	101	7	14
4/16/98	4/30/98	60	12.8	46	85	25	15
5/1/98	5/15/98	67	11.0	44	99	94	14
5/16/98	5/31/98	75	8.8	52	98	140	13
6/1/98	6/15/98	83	11.0	65	125	22	10
6/16/98	6/30/98	86	8.7	72	113	20	15
7/1/98	7/15/98	108	24.7	90	125	2	15
7/16/98	7/23/98	149	n/a	149	149	1	8
					Total:	6,007	200

TABLE 16. Si-weekly catch *summary* of spring-run chinook salmon fishing the screw trap at Adams Dam from 2 March 1998 to 9 May 1998; yearling captures are excluded

Trapping period		Mean FL (mm)	Standard deviation	e FL mm,		Total no. captured	No. trapping days
3/2/98	3/15/98	59	7.2	47	71	432	13
3/16/98	3/31/98	71	14.5	45	86	351	8
4/1/98	4/15/98	72	13.2	49	97	20	12
4/16/98	4/30/98	68	12.4	45	95	62	9
5/1/98	5/9/98	75	11.1	49	124	122	4
					Total:	987	46

The screw trap was installed at the Sutter Bypass site on 15 April 1998 and was fished until 17 July 1998. A total of 15,480 juvenile chinook salmon was captured (Table 17). Of that total, 41 were tagged. Of the 41 CWT recoveries, 36 were released from CNFH (Appendix C) and 5 were released at PPDD or Adams Dam (Table 20).

TABLE 17. Bi-weekly catch summary of spring-run chinook salmon combined the effort of the screen trap and the screw traps at Pmott-Phelan Diversion Dam and Adams Dam from 6 October 1997 to 23 July 1998; yearling captures are excluded.

Trapping period		Mean FL (mm)	Standard deviation	Range FL (mm)		Total no. captured	No. tripping days
10/6/97	10/15/97	-	-	-	-	0	9
10/16/97	10/31/97	-	-	-	-	0	16
11/1/97	11/15/97	-	-	-	-	0	15
11/16/97	11/30/97	31	1.9	28	34	16	12
12/1/97	12/15/97	34	1.8	28	38	148	15
12/16/97	12/31/97	35	1.1	30	38	327	16
1/1/98	1/15/98	36	1.6	31	40	7,036	10
1/16/98	1/31/98	37	4.2	30	58	443	15
2/1/98	2/15/98	34	1.2	33	36	12	9
2/16/98	2/28/98	54	8.0	39	69	23	13
3/1/98	3/15/98	57	7.5	43	71	555	15
3/16/98	3/31/98	70	12.7	45	86	422	14
4/1/98	4/15/98	72	13.8	49	101	27	15
4/16/98	4/30/98	66	13.3	45	95	89	15
5/1/98	5/15/98	71	11.6	44	124	224	14
5/16/98	5/31/98	75	9.2	52	98	175	14
6/1/98	6/15/98	83	10.5	65	125	26	15
6/16/98	6/30/98	86	8.1	72	113	24	15
7/1/98	7/15/98	108	24.7	90	125	2	15
7/16/98	7/23/98	149	-	-	-	1	8
					Total:	9,550	270

TABLE 18. *Summary of* coded-wire tagged spring-run chinook salmon released at Parrott-Phelan Diversion Dam and Adams Dam from 14 January **1998** to **3** April **1998.**

Tag code	Release date range		Capture and release location	Mean FL mm	Range FL mm		Total no. released
06-01-12-01-13	1/14/98	1/25/98	Parrott-Phelan Dam	35	31	42	1,794
06-01-12-01-14	1/30/98	1/30/98	Parrott-Phelan Dam	36	34	37	267
06-01-12-01-15	2/26/98	3/9/98	Parrott-Phelan Dam	60	59	61	98
06-01-12-02-01	3/9/98	3/17/98	Adams Dam	59	47	71	1,018
06-01-12-02-05	3/12/98	3/17/98	Parrott-Phelan Dam	69	56	82	110
06-01-12-02-06	3/26/98	4/3/98	Parrott-Phelan Dam	66	50	76	98
06-01-12-02-02	3/26/98	4/3/98	Adams Dam	72	45	84	23

TABLE **19.** Bi-weekly catch summary of juvenile chinook salmon captured fishing the screw **trap m Sutter** Bypass at West Borrow Weir 1 from **16** April **1998** to **17** July **1998.** Fish captured here can not be identified as spring-run chinook **salmon because of** the mixing of juvenile **salmon** of other races from the Sacramento River.

Trapping period		MeanFL (mm)	Standard deviation	e FL mm		Total no. ca tured	No. trapping davs
4/16/98	4/30/98	89	10.2	43	130	10,568	15
5/1/98	5/15/98	90	11.3	51	130	3,090	15
5/16/98	5/31/98	89	11.0	56	131	1,261	15
6/1/98	6/15/98	86	12.1	37	126	457	15
6/16/98	6/30/98	87	7.0	66	104	102	15
7/1/98	7/15/98	95	12.7	86	104	2	15
7/16/98	7/17/98	-	-	-	--	0	2
					Total:	15,480	92

TABLE 20. Recaptures *of* spring-run chinook salmon bearing coded-wire **tags.** *All* fish were tagged at either Pmott-Phelan Diversion Dam or Adams Dam; all fish were **recaptured** at Sutter Bypass West Borrow Weir 1. All fish were from the **1997** brood year.

Tag code	Recovery date	Recovery FL (mm)	Growth rate (mm/d)	d at large
06-01-12-01-15	**5/24/98**	84	0.30	**81**
06-01-12-02-01	5/21/98	**81**	0.32	69
06-01-12-02-05	**4/24/98**	74	0.13	40
06-01-12-02-05	**5/22/98**	**75**	0.09	**68**
06-01-12-02-05	**5/24/98**	**80**	**0.16**	70

Juvenile Outmigration

Both YOY and yearling juvenile SRCS outmigration patterns were documented based on length of juvenile salmon captured at PPDD and by juvenile salmon observed during the summer adult escapement snorkel surveys. The majority of Butte Creek SRCS begin outmigrating as fry during high flows starting in mid-November. Some YOY remain in Butte Creek above PPDD and rear until later in the spring or early summer, then begin outmigrating. Yearling SRCS outmigrate as early as October. The length-fiequency distributions in Appendix B are an indicator of timing and not an indicator of abundauce. During the peak of outmigration, YOY fish number in the thousands. Later in the spring, YOY outmigration number in the hundreds.

Recently emerged fry were trapped at PPDD in the spring, and were assumed to be late-fall-run chinook salmon and are marked on the length-fiequency distributions in Appendix B. The line indicating late-fall-run chinook salmon (Appendix B) is an approximate delineation of late-fall-run and spring-run chinook salmon. Neither yearling SRCS nor late-fall fry were tagged, except for the 20 SRCS yearlings tagged in 1996 (Table 12).

Growth

Yearling SRCS grow to 150 mm FL and remain in Butte Creek for 12 months or more before leaving Butte Creek. These fish were captured at PPDD fiom October through December (Appendix B, Figures 1 and 2).

YOY grow to over 100 mm FL before exiting the system. Fish tagged at PPDD with two tag codes and recovered in the Sutter Bypass from the 1995 brood year provided enough recaptures for a basis to determine mean growth. Fish recovered fiom tag group B6-12-01 averaged 89 mm FL and ranged fiom 73 mm FL to 108 mm FL. Fish recovered fiom tag group B6-12-02 averaged 85 mm FL and ranged fiom 67 mm FL to 113 mm FL.

Although we calculated a growth rate for these salmon (Tables 6, 7 and 20), it is a general conclusion Fish were released over a large number of days so the true number of days-at-large before recapture can not be determined. For example, tag group B6-12-01 was released over a range of 22 days and tag group B6-12-02 was released over a range of 52 days. These fish were not of uniform length. The length at tagging for tag group B6-12-01 ranged fiom 30 mm FL to 53 mm FL and for tag group B6-12-02 ranged from 31 mm FL to 79 mm FL. A mean FL was used.

Relative Abundauce

We were unable to make an estimate of relative abundance based on catches at PPDD. We were unable to standardize effort on an annual basis.

Adult Escapement

TABLE 21. Estimates of adult spring-m salmon escapement in Butte Creek from snorkel surveys taken annually from 1994 through 1997.

Year	Estimate	Survey dates
1994	474	29 June - 1 July 1994
1995	7,480	24 July - 27 July 1995
1996	1,400	19 August - 23 August 1996
1997	635	18 August - 21 August 1997

DISCUSSION

Anadromous fish monitoring of Butte Creek is difficult because it is a free-flowing stream lacking large dams to buffer or control flows. Butte Creek daily flows for the 1995 through 1998 water years were extremely variable (Appendix A). The PPDD screw trap was destroyed by high flow in February, 1996. On 1 January 1997, Butte Creek flowed at 26,600 cfs, incised a new channel on the far side of the canyon from PPDD, and left the fish traps behind In addition to these catastrophic flow events, the common high flow events, when the majority of fry may be moving downstream, are generally when trapping must be suspended because of danger to equipment or personnel.

Juvenile Outmigration

The trapping data from PPDD indicate that most SRCS in Butte Creek begin their downstream migration as fry or fingerlings. A portion of Butte Creek SRCS do outmigrate as yearlings. Salmon greater than 80 mm FL captured at PPDD each year in the fall and early winter are outmigrating yearling salmon (Appendix B). Yearling salmon were also seen upstream of PPDD during the summer adult escapement surveys. Yearling salmon may avoid the traps more effectively than YOY SRCS, so it is difficult to quantify the proportion that outmigrate under each scenario.

Butte Creek SRCS outmigration is prolonged and variable and juveniles are present in Butte Creek upstream of PPDD all year, because of yearling holdover. Butte Creek SRCS outmigration began as early as October — demonstrated by a 144 mm yearling salmon captured at PPDD 9 October 1996. The earliest fry were seen in the third week of November and outmigration peaked during a 4- to 10- week period between December and April (Tables 3, 11, and 17). Alevin emergence began in late November and extended approximately though mid-January. Juvenile SRCS were trapped at PPDD as late as 19 July and at the Sutter Bypass as late as July 1 (both in 1998).

Recently emerged fry were trapped at PPDD beginning in March or early April (Appendix B). These fish are assumed to be late-fall-run chinook salmon, though no late-fall-run adult salmon

have yet been documented in Butte Creek due to high flow and high turbidity water conditions. We observed late-fall-run salmon adults in nearby Big Chico Creek, where water flow was lower and spawning activity could be documented, and these observations were used to justify the assumption that these spring alevins are late-fall-run chinook salmon.

Sutter Bypass trapping and CWT recaptures suggest that salmon use the Sutter Bypass as a nursery area until it begins to drain in the late winter or spring, at which time the salmon are captured in very large numbers as they exit the West Borrow (Figure 1). While trapping becomes more efficient as the Sutter Bypass drains, the large and rapid increase in capture seems to be due to fish behavior more than simply trapping efficiency. Few fish are captured after mid-May. Any salmon that remain in the Sutter Bypass into the summer months would perish due to high water temperature.

Five 1995/1996 CWT recaptures were from downstream of the Sutter Bypass; four from the mainstem Sacramento River and one from the Delta at Chipps Island (Table 7). The mainstem recaptures were between 2 April and 9 April 1996 and the Delta recapture was on 8 May 1996. These fish ranged in size from 77 mm FL to 95 mm FL. Based on these five recaptures, SRCS leaving the Sutter Bypass may move downstream rapidly and do not have to use the mainstem Sacramento River for further rearing.

Growth

SRCS growth occurs upstream of PPDD (Tables 3, 8, 9, 14, and 15). Outmigrating fry rear downstream of PPDD. Most fish captured at PPDD are less than 40 mm in length, but a portion remain in the spawning area until the spring before beginning to outmigrate. Many of these later-outmigrating fingerlings reach lengths of greater than 100 mm FL. Clearly, the portion of Butte Creek upstream of PPDD is an important component of the nursery habitat.

CWT recaptures from the Sutter screw trap suggest that the Sutter Bypass, when flooded in winter and spring, provides growth opportunity for juvenile salmon. Fish tagged at an average size of 36 mm FL at PPDD were recovered in the Sutter Bypass at an average 89 mm FL. Some of these recovered fish were greater than 100 mm FL. Healey (1991) and Kjelson et al. (1982) reported that 70 mm FL is the approximate S i that chinook salmon need to reach before they *can* enter salt water. *Almost* all chinook salmon captured at the Sutter Bypass site after 1 March are larger than 70 mm FL (Tables 5, 13, and 19). These salmon that have reared in the Sutter Bypass are large enough to enter saltwater and probably do not use the mainstem Sacramento River or the Delta for substantial rearing, but migrate directly to the ocean. Nursery habitat use, vulnerability to *stranding* and predation, and overall survival need clearer definition for *salmonids* that use the Sutter Bypass and the mainstem Sacramento River or Delta.

Kjelson et al. (1982) found fall-run chinook salmon growth rates averaging 0.86 mm/d (range 0.57 to 1.23) in 1980 and 0.53 mm/d (range 0.40 to 0.69) in 1981, for fish that reared in the Delta. They found growth rates averaging 0.33 mm/d (range 0.26 to 0.40) for fish that reared in the upper Sacramento River in 1981. Even though our calculation of grow rate is rough, growth rates for Butte Creek fish are similar to that of Kjelson's (Tables 6 and 20).

Because juvenile salmon from the main stem Sacramento River *mix* with Butte Creek SRCS, two of the Sutter Bypass CWT recaptures during 1995/1996 were from *CNFH* (one late-fall-run and one winter-run chinook salmon, Appendix C). During 1997/1998, of the 41 tags recovered in the

Sutter Bypass, five were of Butte Creek origin; the remaining 36 were fall-run chinook released from CNFH (Appendix C).

Using Fisher's length criteria[3/], 49 of 59 Butte Creek SRCS CWT recaptures were identified as SRCS. One was identified as winter-run and nine were identified as fall-run chinook *salmon.* It is possible, many of the three sampling years, that a very small proportion of the tagged salmon may have actually been fall-run salmon because of the few fall-run salmon that spawned *upstream* of PPDD each year.

Relative Abundance

Determination of relative abundance of SRCS outmigration was one of the goals of this study. Relative abundance is determined by comparing the PPDD trapping yields for the three sampling years. However, because of the factors affecting fish trapping at that site, primarily flow events, debris, and operational practices of the PPDD, the abundance cannot be compared except in the most general of terms. Of almost 130,000 SRCS juveniles captured at the PPDD during the three-year period, over 90 % were captured during the 1995-1996 *sampling* year. While it is reasonable to conclude, based on adult escapement, that more SRCS were produced from the 1995 brood *than* either of the following two, it is impossible to quantify the magnitude of difference in the three years.

An estimate of absolute abundance of emigrating juvenile SRCS would be very desirable. However, the inability to determine trap efficiency during the peak emigration period (December through April) because of the factors discussed above, makes total abundance resolution impossible.

Adult Escapement

Adult escapement was determined by snorkel survey of the entire summer holding area. The high estimate is used for comparing the three years, because snorkel surveys underestimate actual salmon abundance (Shardlow, et al. 1987). The 1995 adult escapement was estimated at 7,480 adult SRCS. This near-record escapement was probably partly due to high Butte Creek outflow during the winter and spring of 1992/1993, when most of these 1992 brood year juveniles would have been outmigrating. The 1996 and 1997 escapement estimates (1,400 and 635 adults, respectively), while much lower than the 1995 estimate, *are* still well above average for the 1979 to 1994 period at 461 adult SRCS.

Until recently, spatial separation of spring-run and fall-run spawning habitat has been at, or downstream of, PPDD. However, because of recent fish passage improvements to that and other downstream dams and because of favorable fall flows, some fall-run salmon have ascended PPDD ladder. In fall 1997, particularly, several hundred adult fall-nm chinook salmon spawned upstream of PPDD. Superimposition of redds is of concern, as is interbreeding of fall-run and SRCS.

Feather River water is introduced to Butte Creek via the West Branch into DeSabla Reservoir and was introduced, until 1998, from Thermolito Afterbay via Western *canal.* There are concern that Feather River SRCS adults may stray into Butte Creek. Butte Creek fall-run chinook salmon

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[3/] Ibid, p 14.

surveys have recovered three Feather River Hatchery CWT adult salmon, but, as yet, no tagged Feather River-origin SRCS have been found in Butte Creek. However, due to scavenging animals and remote, steep terrain, few SRCS carcasses are examined each year in Butte Creek. Future adult sampling will include expanded adult carcass surveys to recover Butte Creek SRCS that were tagged. This additional effort will help to evaluate straying by Feather River fish into Butte Creek.

ACKNOWLEDGMENTS

This work was supported by funding provided by the U.S. Fish and Wildlife Service, Central Valley Anadromous Fish Restoration Program and by the Federal Aid in Sport Fish Restoration Act, in partnership with the California Department of Fish and Game.

LITERATURE CITED

California Department of Fish and Game. 1998. A Status Review of the Spring-run Chinook Salmon *(Oncorhynchustshawytscha)* in the Sacramento River Drainage. Prepared by Calif. Dept. Fish and Game. June 1998.

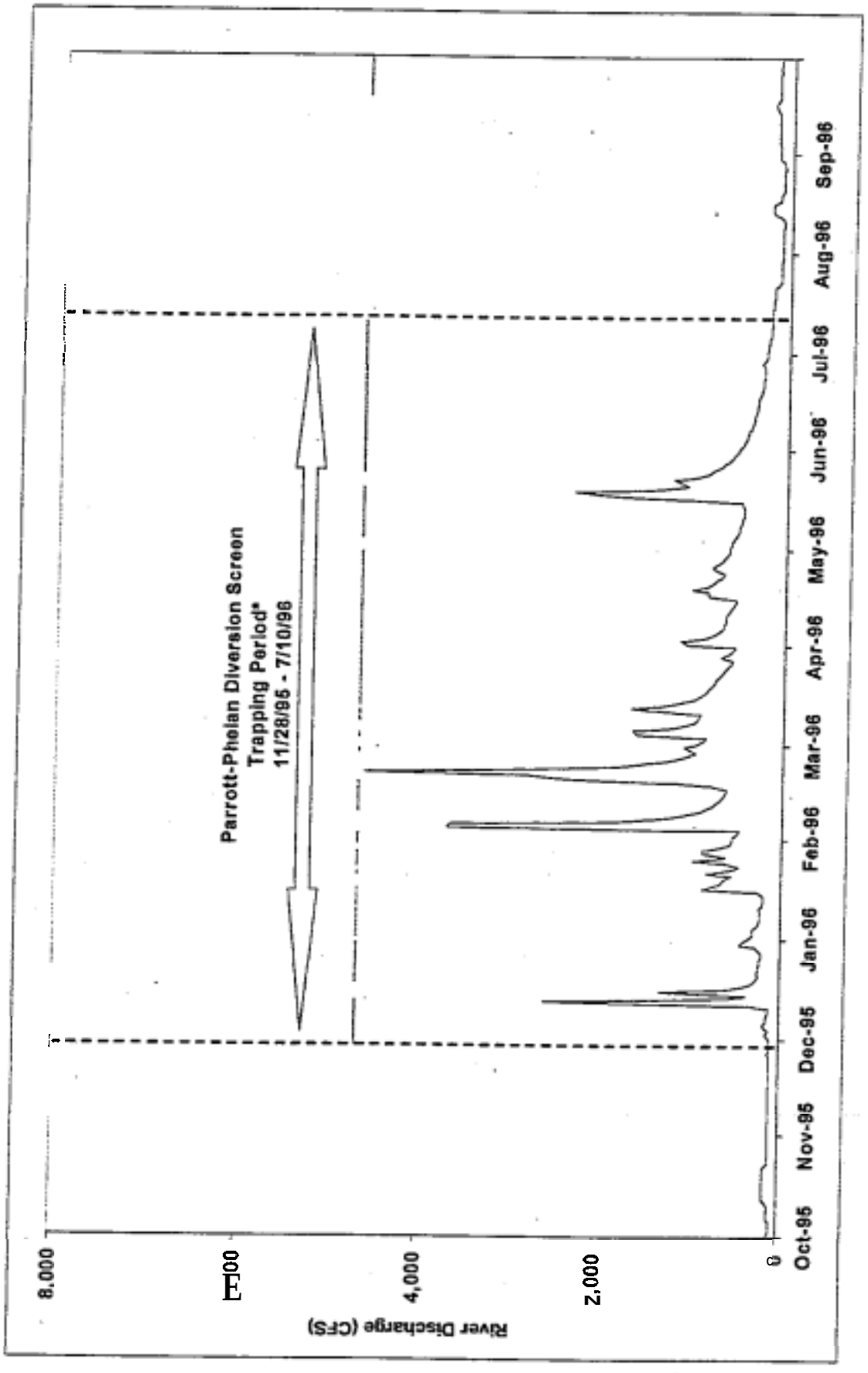
Department of the Army, 1975. Wild, Scenic and Recreational Characteristics, Sacramento River, California, Keswick Dam to Sacramento. Department of the Army, Sacramento District, *Corps* of Engineers, Sacramento, Califomia. 155p + appendices.

Healey, M.C. 1991. Life History of Chinook Salmon *(Oncorhynchustshawytscha)*. p. 313-393. *In:* C. Groot and L. Margolis (eds.). Pacific salmon life histories. UBC Press, Vancouver.

Kjelson, M.A., P.F. Raquel, and F.W. Fisher. 1982. Life history of fall-run juvenile chinook salmon, *Oncorhynchus tshawytscha*, in the Sacramento-San Joaquin Estuary, California p. 393-411. *In:* V.S. Kennedy (ed.). 'Estuarine comparisons. Academic Press, New York.

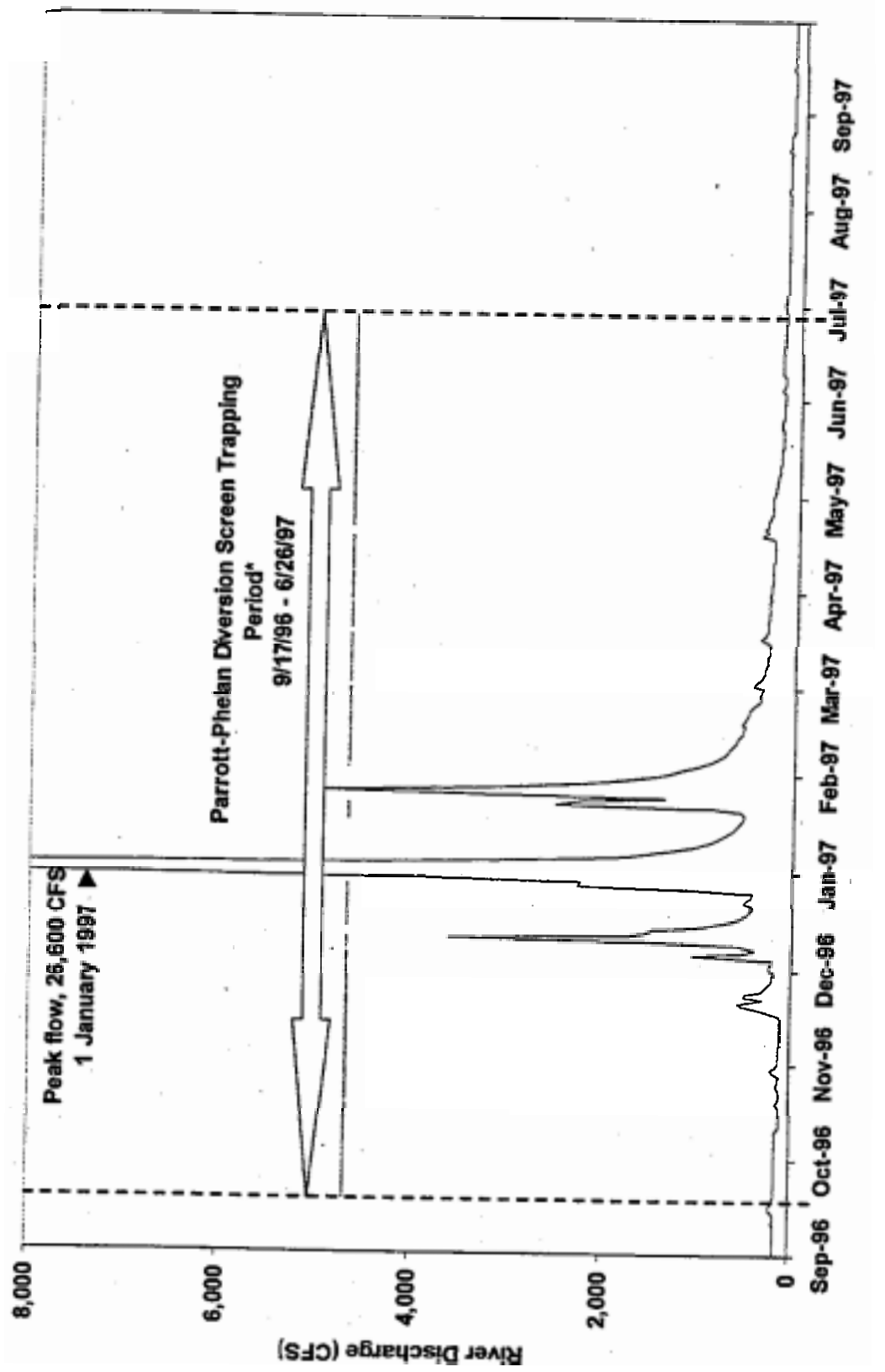
Shardlow, T., R. Hilborn and D. Lightly. 1987. Components analysis of instream escapement methods for Pacific salmon (*Oncorhynchus* spp.). Can. J. Fish. Aquat. Sci. 44: 1031-1037.

APPENDIX A, FIGURE 1. Butte Creek flow at Parrott-Phelan Diversion Dam, water year 1995-96, with trapping period shown. Flow data provided by U.S. Geological Survey, Butte Creek near Chico, California gage.



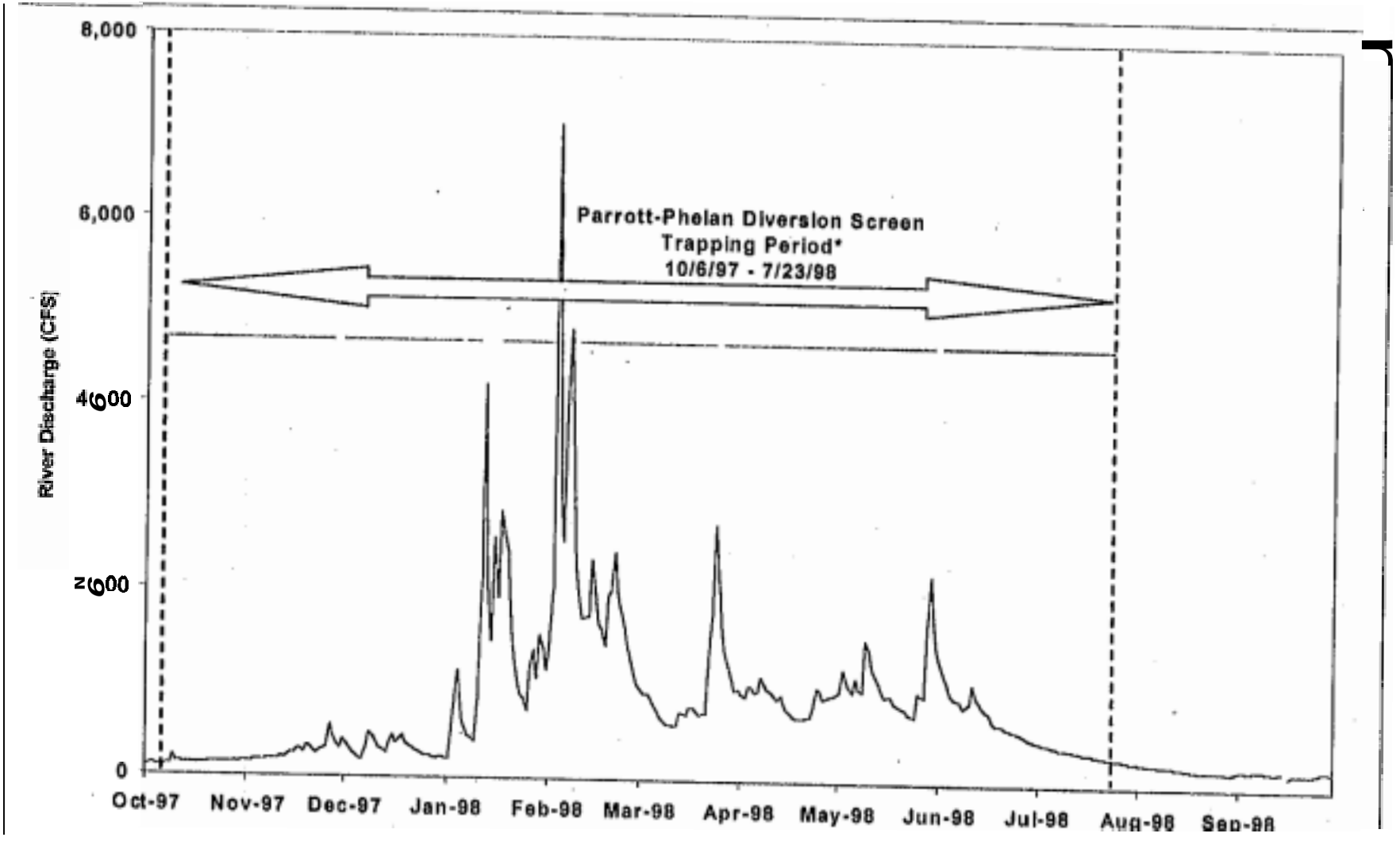
*Breaks in horizontal line indicate periods of time when the trap was not fishing

APPENDIX A, FIGURE 2. Butte Creek flow at Parrott-Phelan Diversion Dam, water year 1996-97, with trapping period shown. Flow data provided by U.S. Geological Survey, Butte Creek near Chico, California gage.



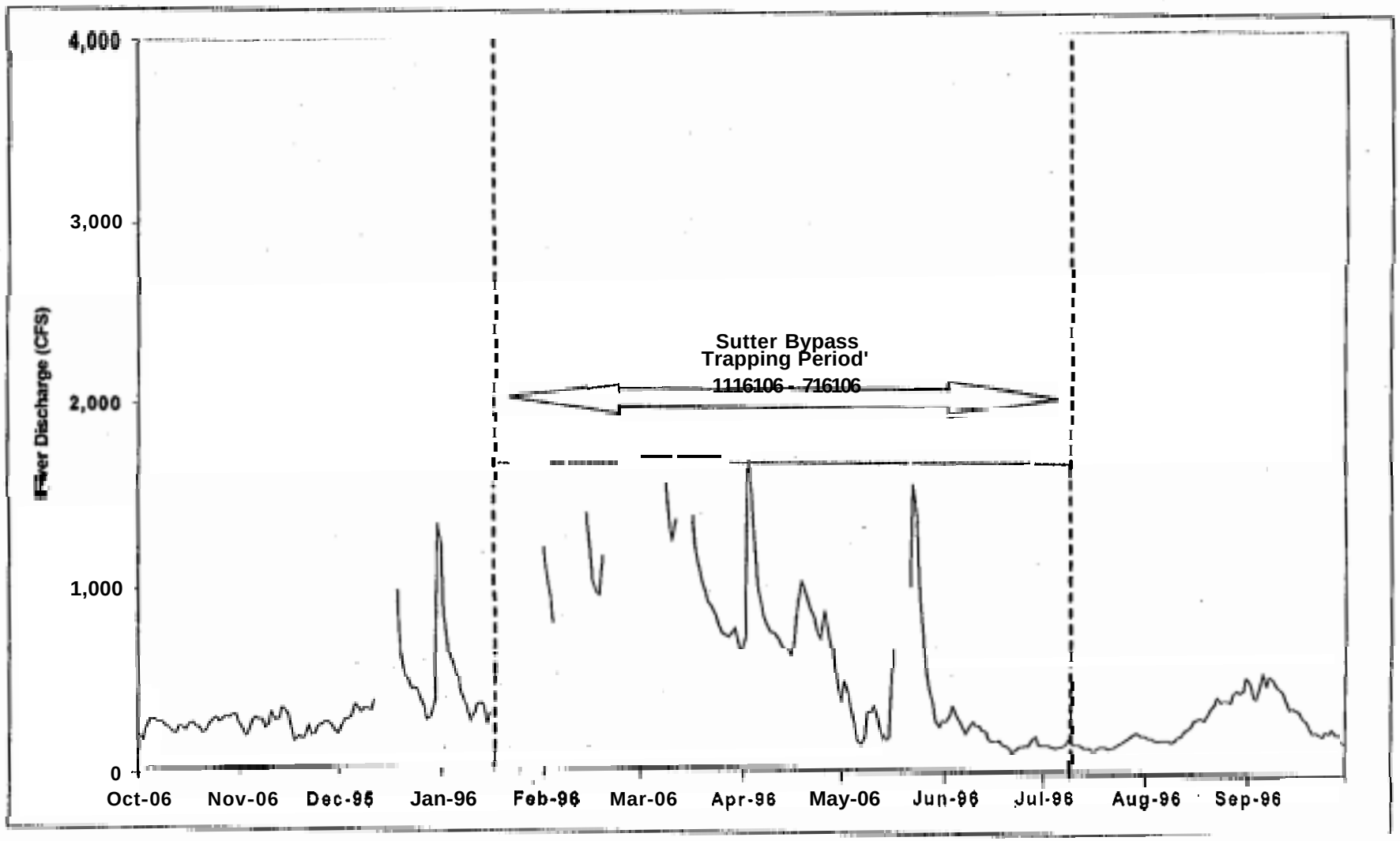
*Breaks in horizontal line indicate periods of time when the trap was not fishing

APPENDIX A, FIGURE 3. Butte Creek flow at Parrott-Phelan Diversion Dam, water year 1997-98, with trapping period shown. Flow data provided by U.S. Geological Survey, Butte Creek near Chico, California gage (preliminary data, subject to revision).



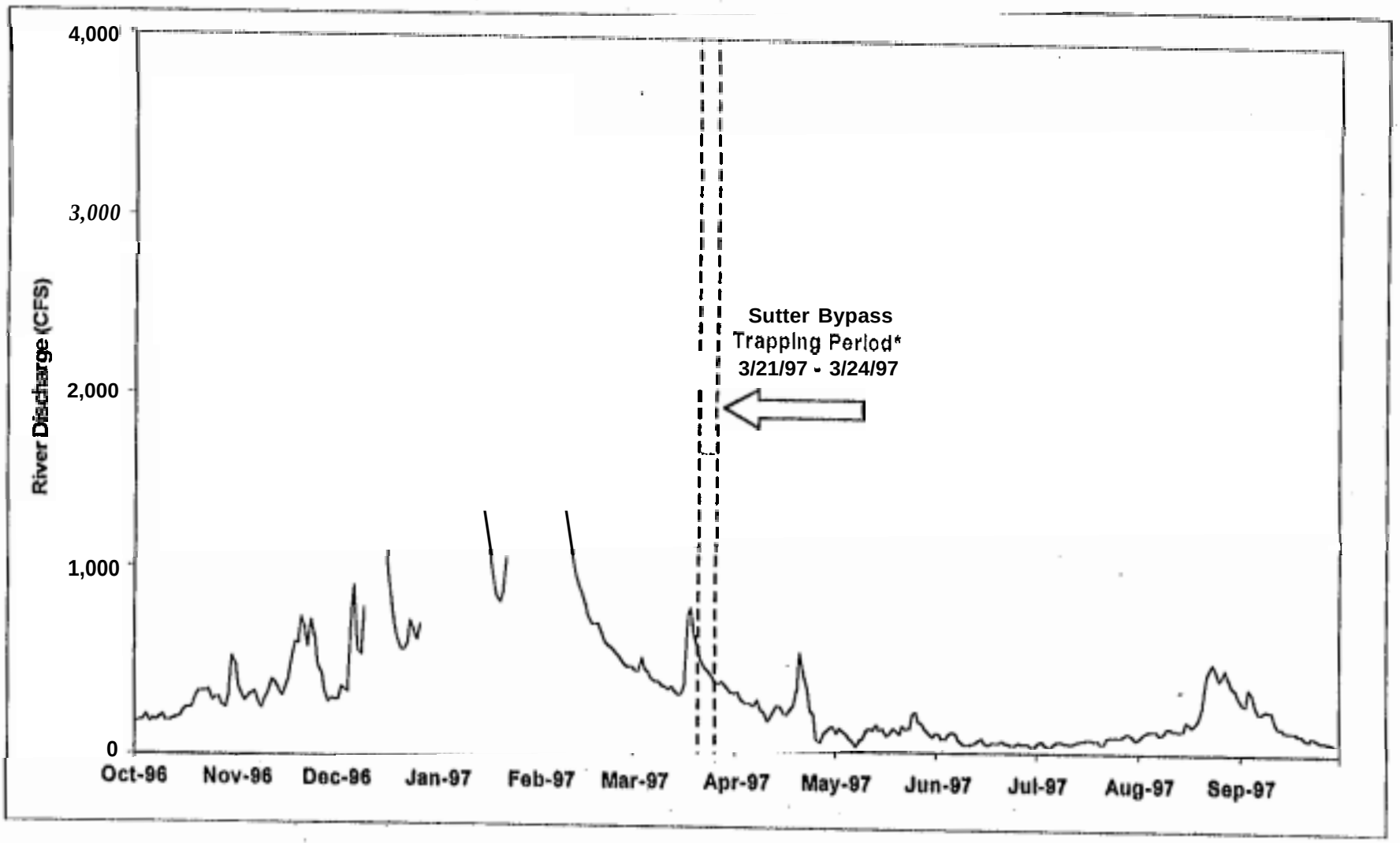
*Breaks in horizontal line indicate periods of time when the trap was not fishing

APPENDIX A, FIGURE 4. Butte Creek flow at Gridley, water year 1995-96, with trapping period shown. Flow data provided by California Department of Water Resources, Butte Creek near Gridley, California gage (preliminary data, subject to revision).



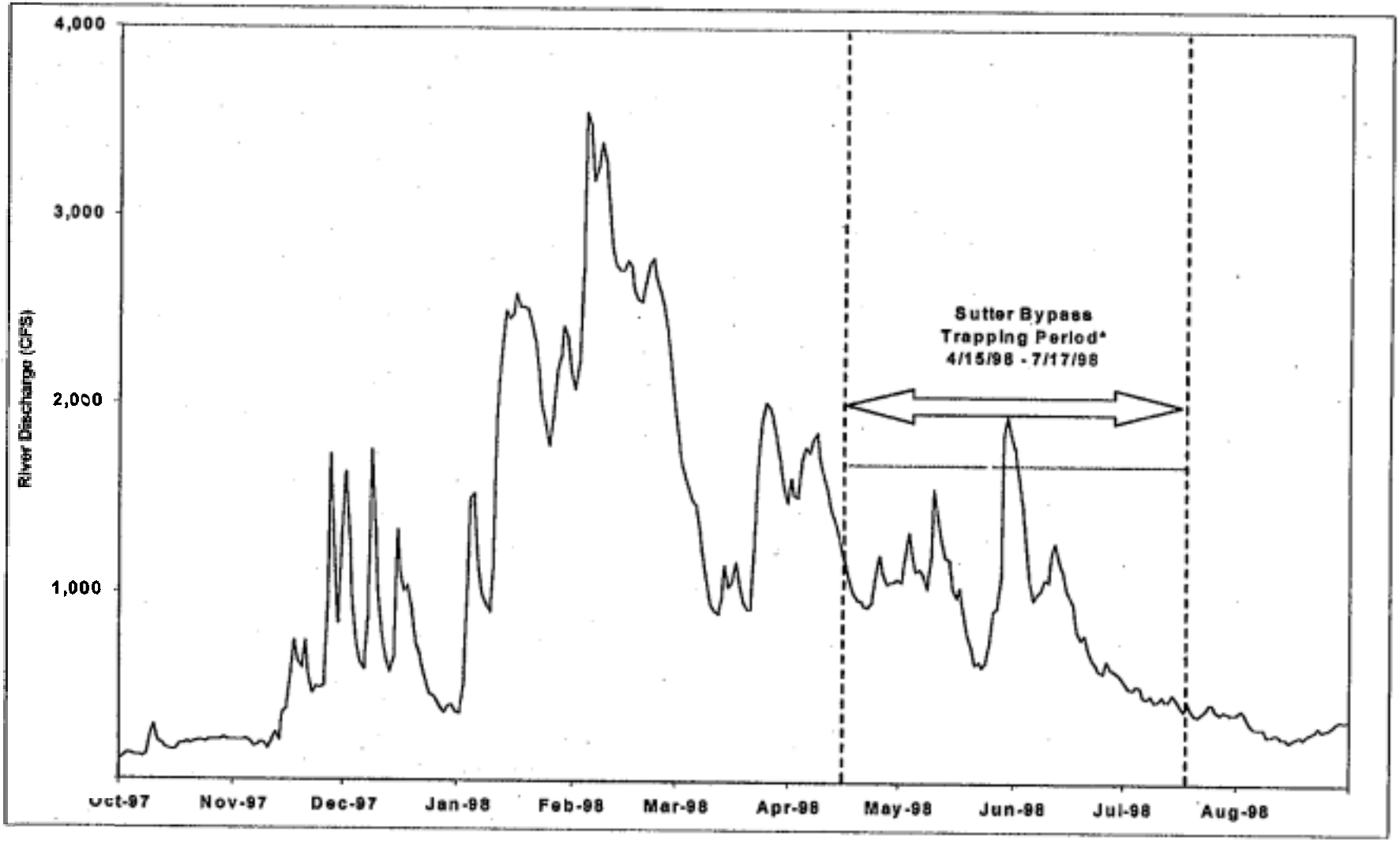
*Breaks in horizontal line indicate periods of time when trap was not fishing

APPENDIX A, FIGURE 5. Butte Creek flow at Gridley, water year 1996-97, with trapping period shown. Flow data provided by California Department of Water Resources, Butte Creek near Gridley, California gage (preliminary data, subject to revision).



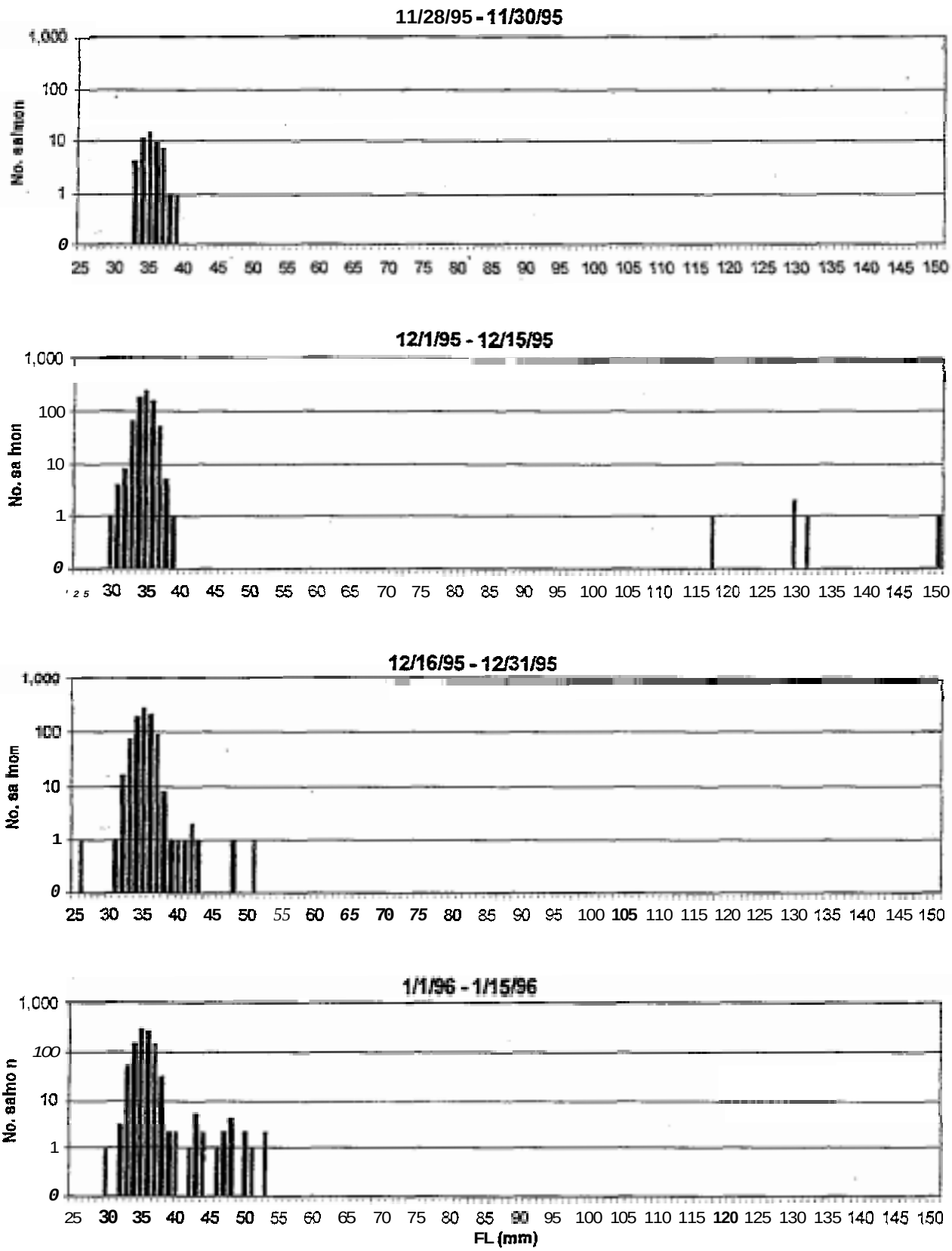
*Breaks in horizontal line indicate periods of time when trap was not fishing

APPENDIX A, FIGURE 6. Butte Creek flow at Gridley, water year 1997-98, with trapping period shown. Flow data provided by California Department of Water Resources, Butte Creek near Gridley, California gage (preliminary data, subject to revision).

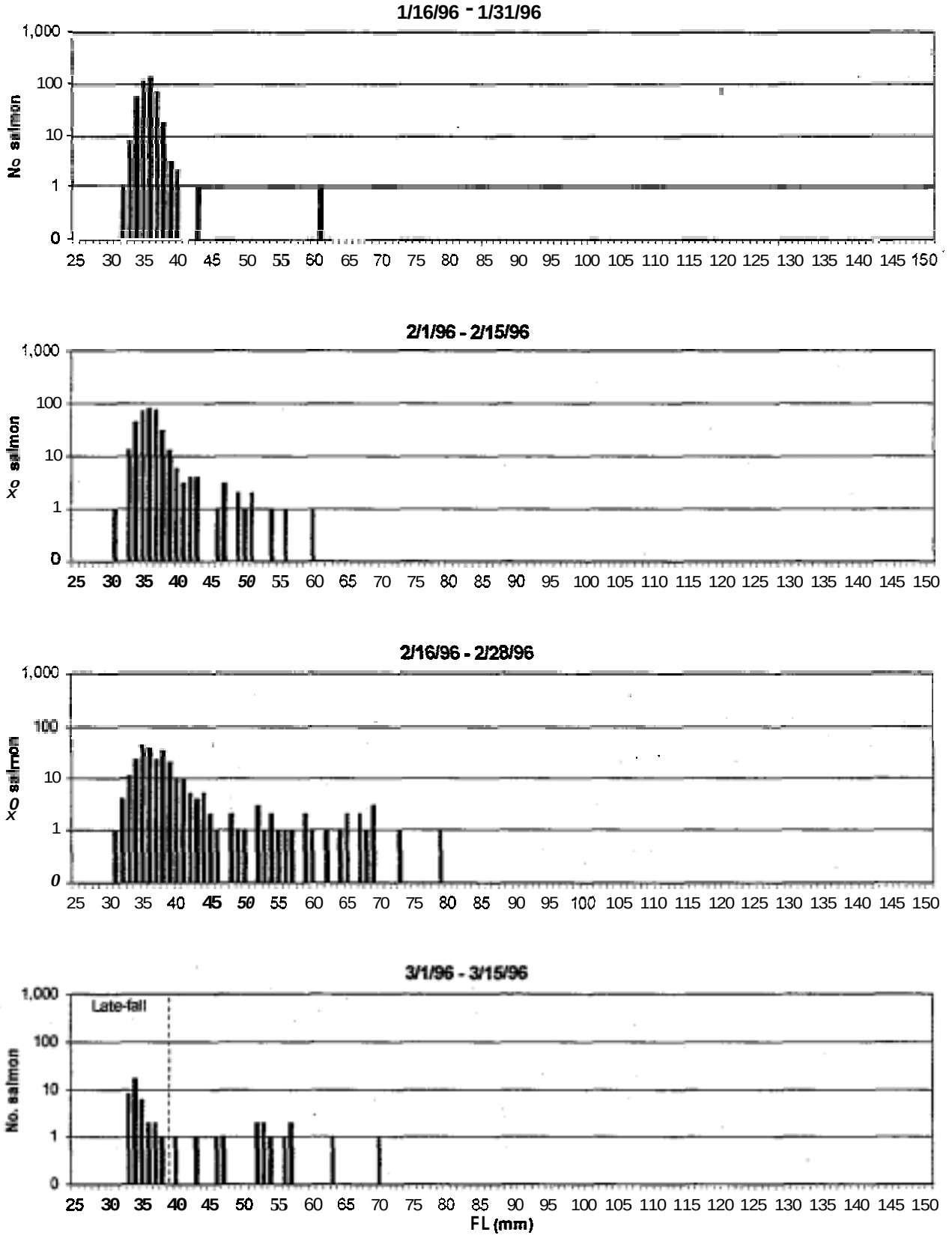


*Breaks in horizontal line indicate periods of time when trap was not fishing

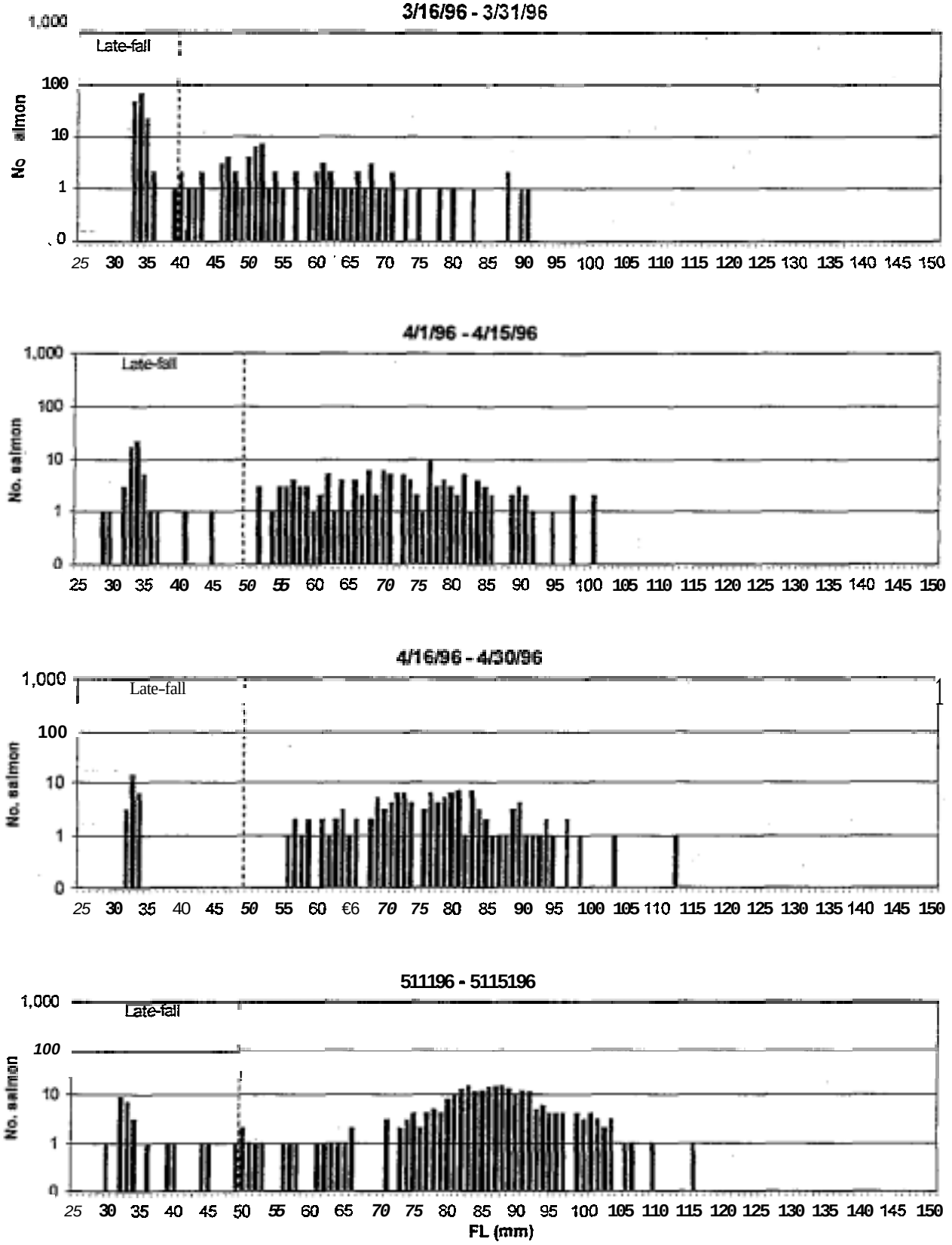
APPENDIX B, FIGURE 1. **Frequency distribution of lengths of juvenile chinook** salmon caught **and released at** Parrott-Phelan **Diversion** Dam **and** Adams Dam **from 28 November 1995 through 8 July 1996.** All **fish are spring-run chinook salmon except where** indicated



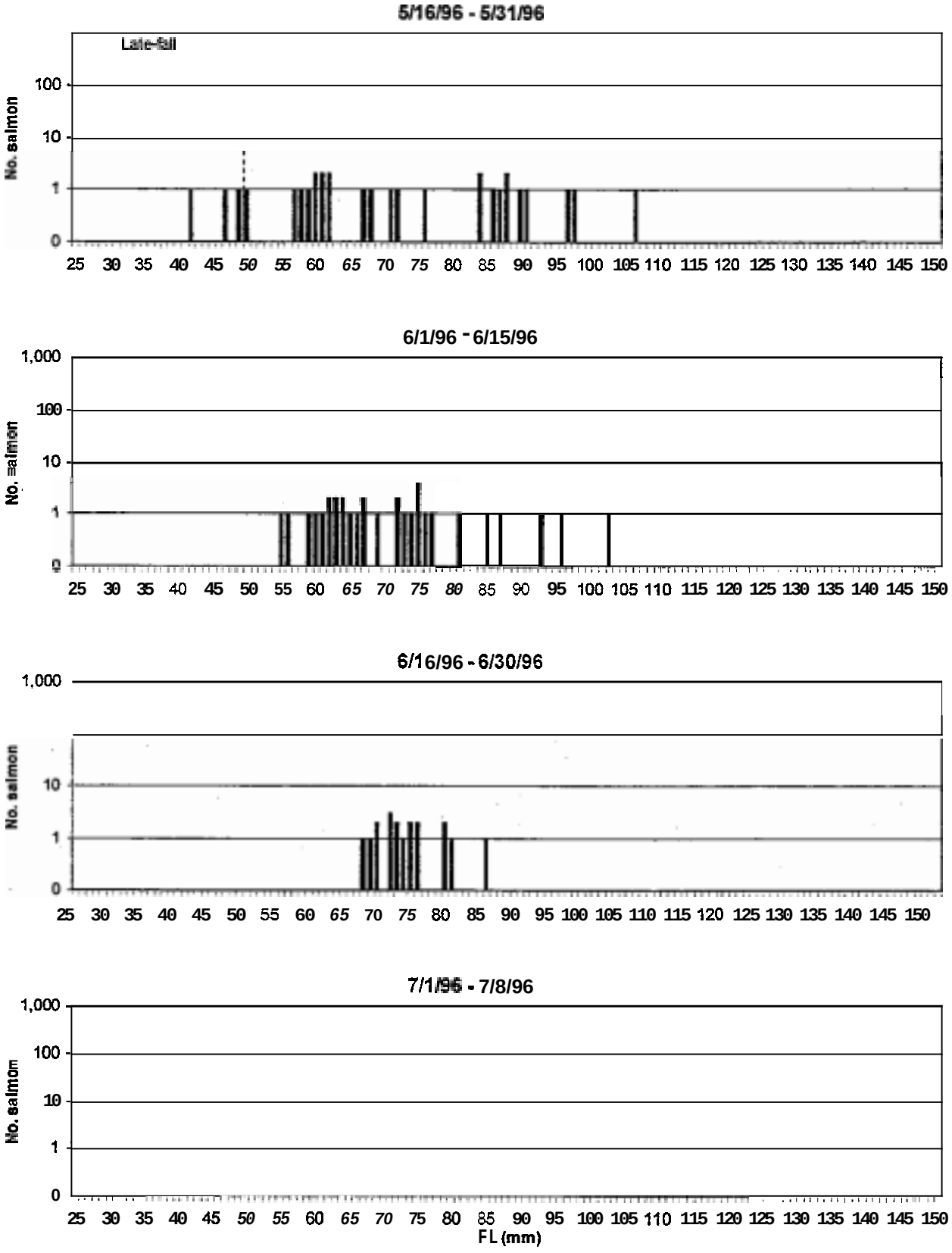
APPENDIX B, **FIGURE** 1 (continued): **Frequency** distribution of lengths of juvenile **chinook** salmon caught **and** released at Parrott-Phelan Diversion Dam **and Adams** Dam from **28** November 1995 **through 8 July** 1996. All fish are spring-m **chinook** salmon except where indicated.



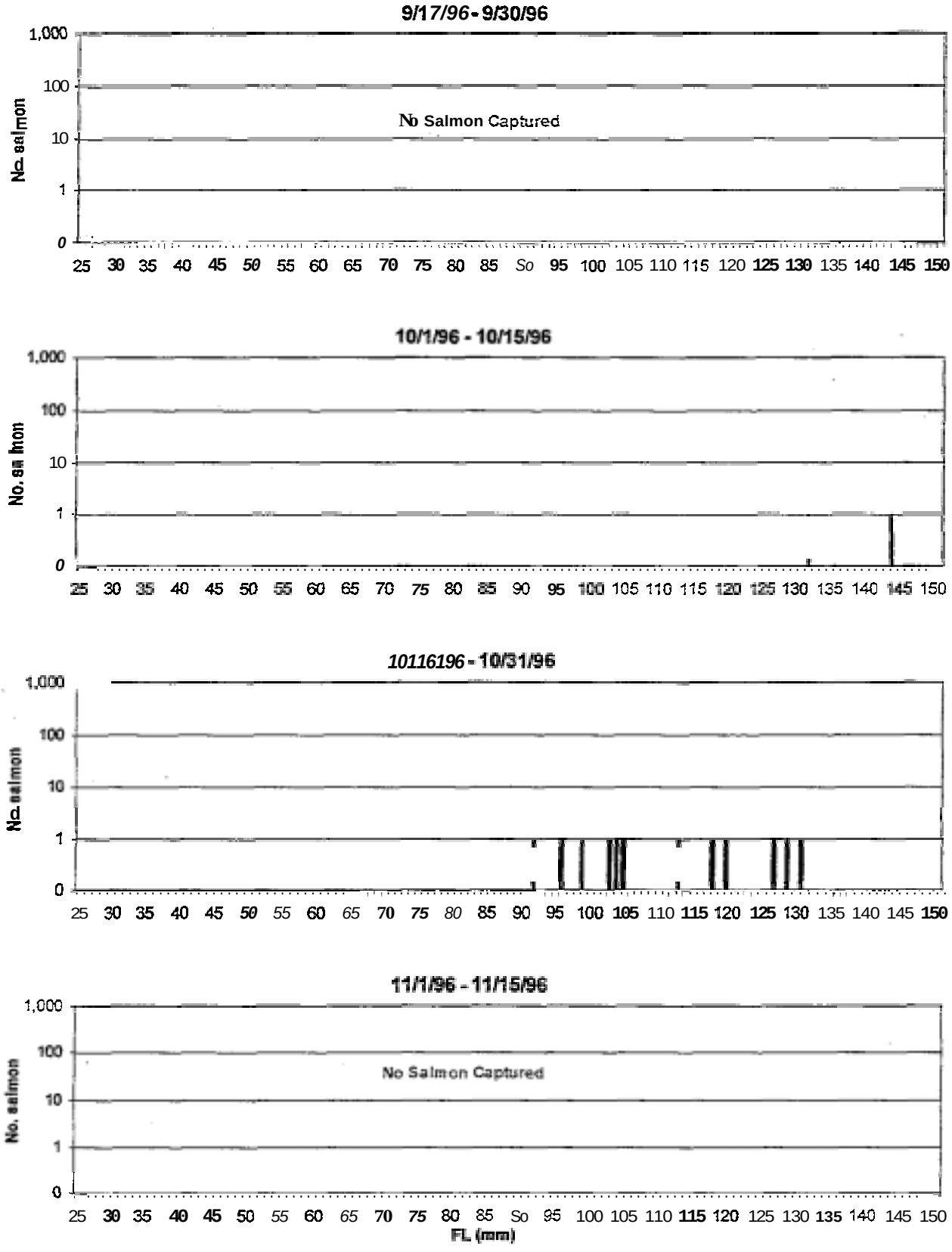
APPENDIX B, **FIGURE** 1 **(continued).** Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott–Phelan **Diversion Dam** and Adams **Dam** from 28 November **1995** through **8 July 1996.** All fish are **spring-nm** chinook *salmon* except where indicated



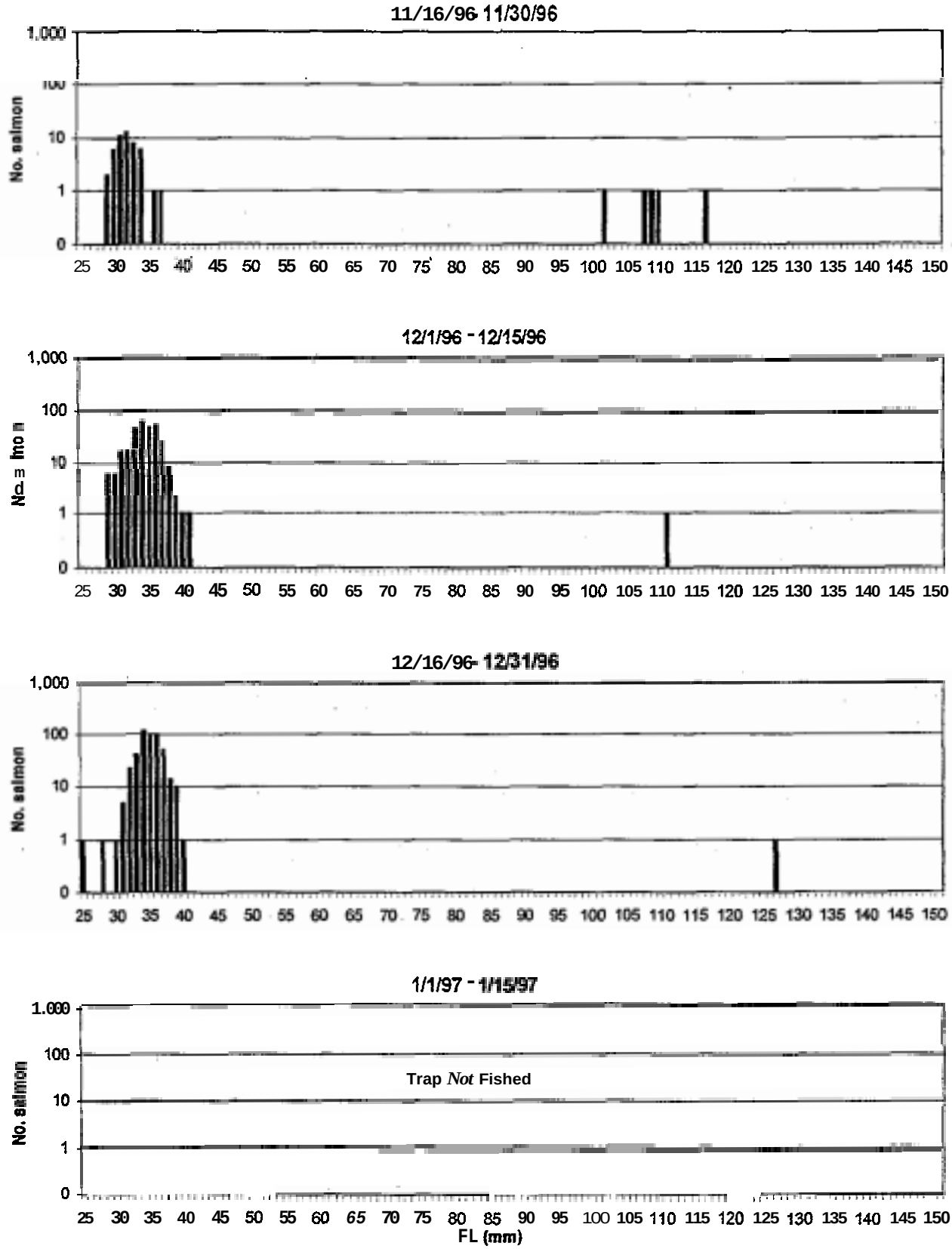
APPENDIX B, FIGURE 1 **(continued). Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 28 November 1995 through 8 July 1996. All fish are spring-run chinook salmon except where indicated.**



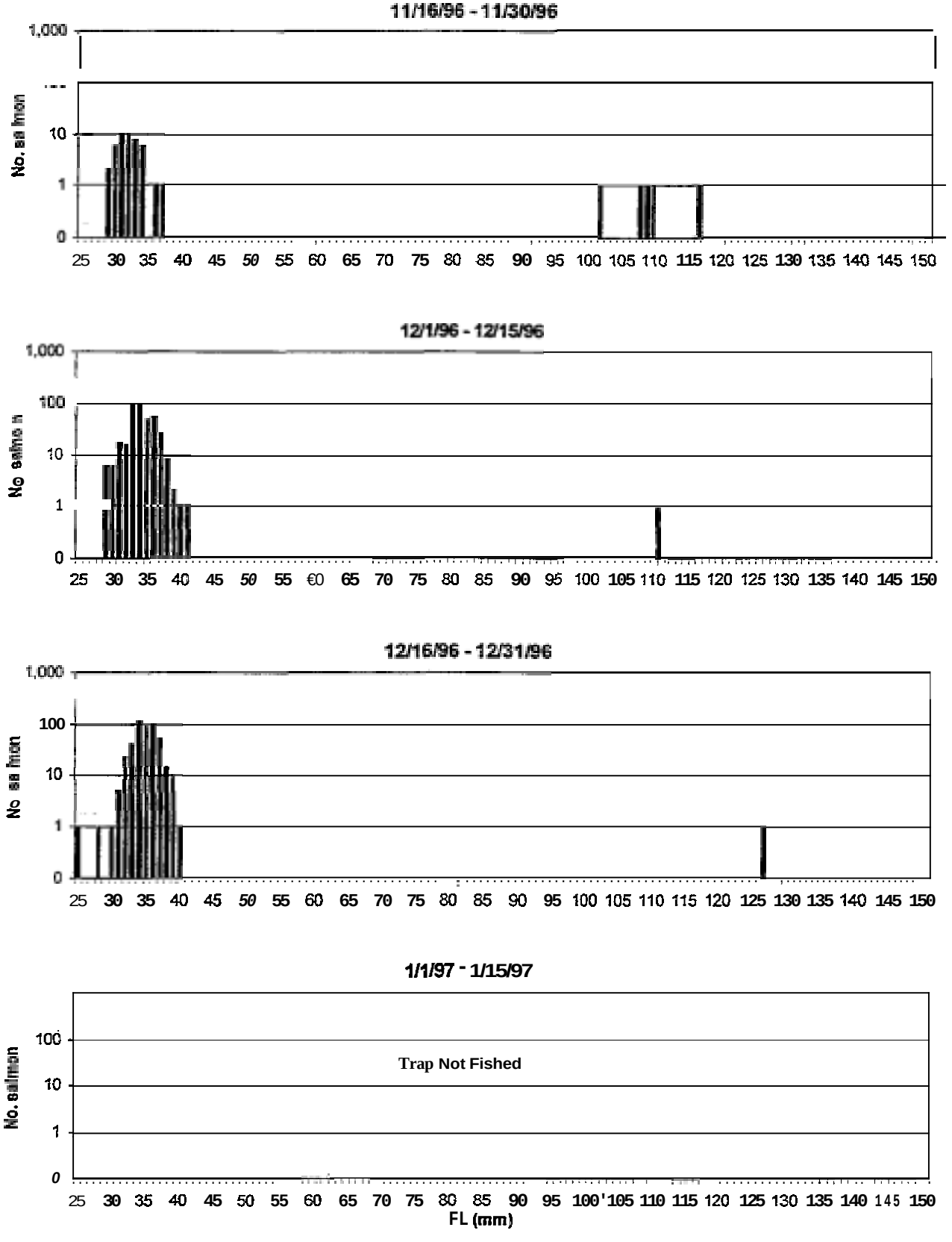
APPENDIX B, FIGURE 2. Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 17 September 1996 through 26 June 1997. All fish are spring-run chinook salmon except where indicated



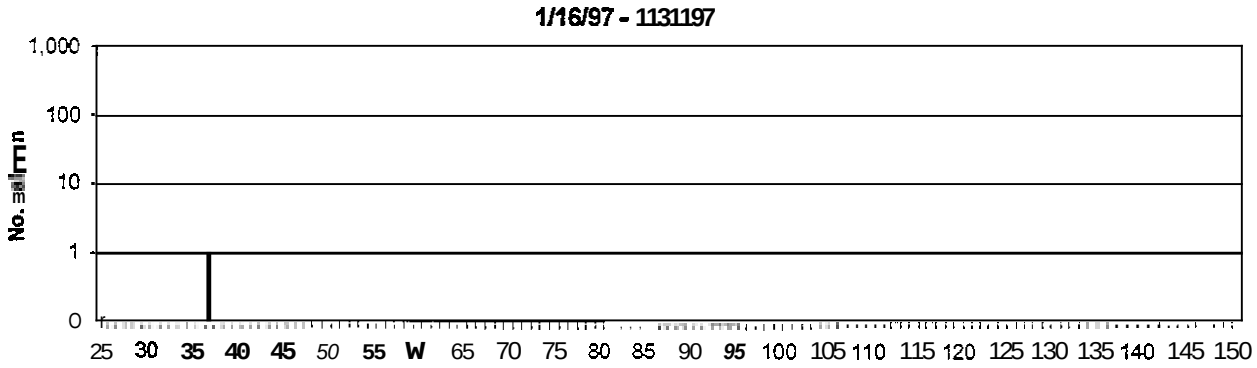
APPENDIX B, FIGURE 2. (continued) Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 17 September 1996 through 26 June 1997. All fish are spring-run chinook salmon except where indicated.

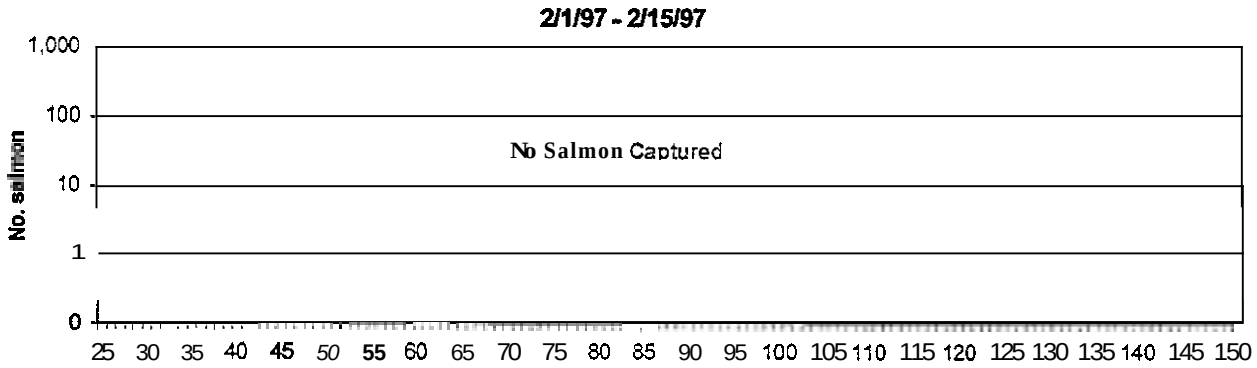


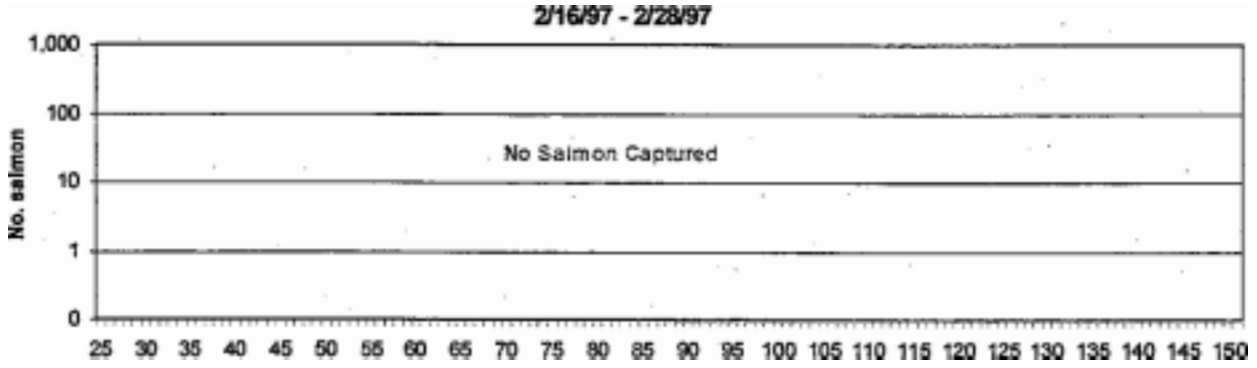
APPENDIX B, FIGURE 2 (continued). Frequency **distribution of lengths of juvenile** chinook salmon **caught and released at Parrott-Phelan Diversion** Dam **and Adams Dam from 17 September 1996** *through 26* **June 1997. All fish are spring-run chinook salmon except where indicated.**

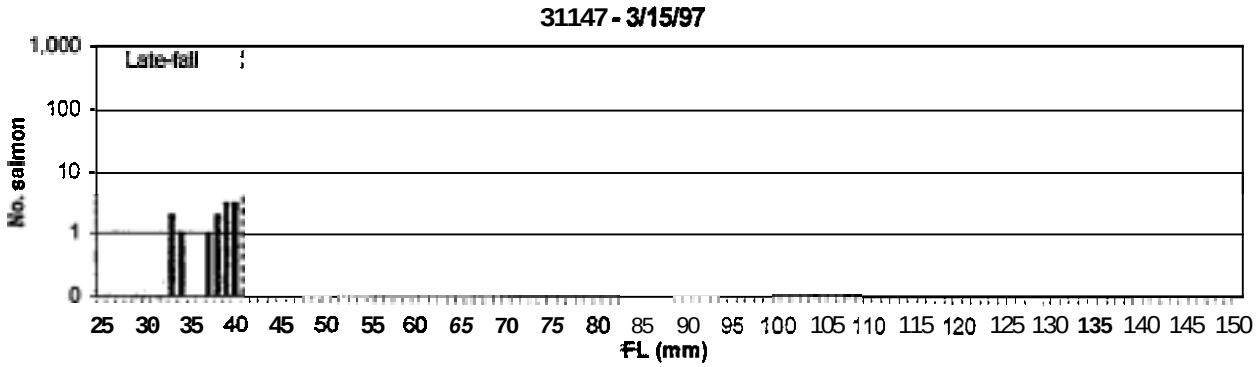


APPENDIX B, FIGURE *2* **(continued).. Frequency** distribution **of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam** from **17 September 1996 through** *26* **June 1997. All** fish **are spring-run chinook** salmon except **where indicated.**

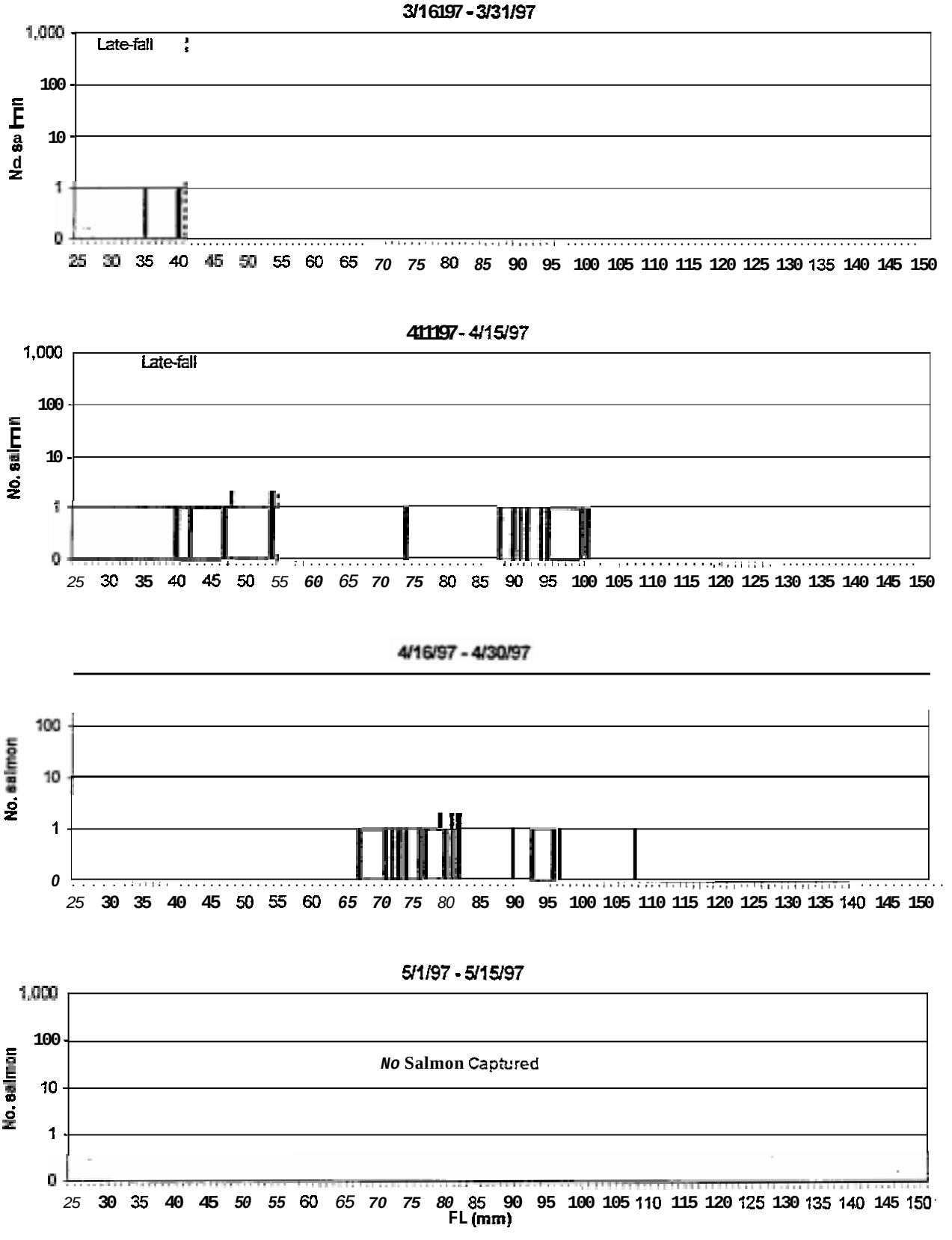




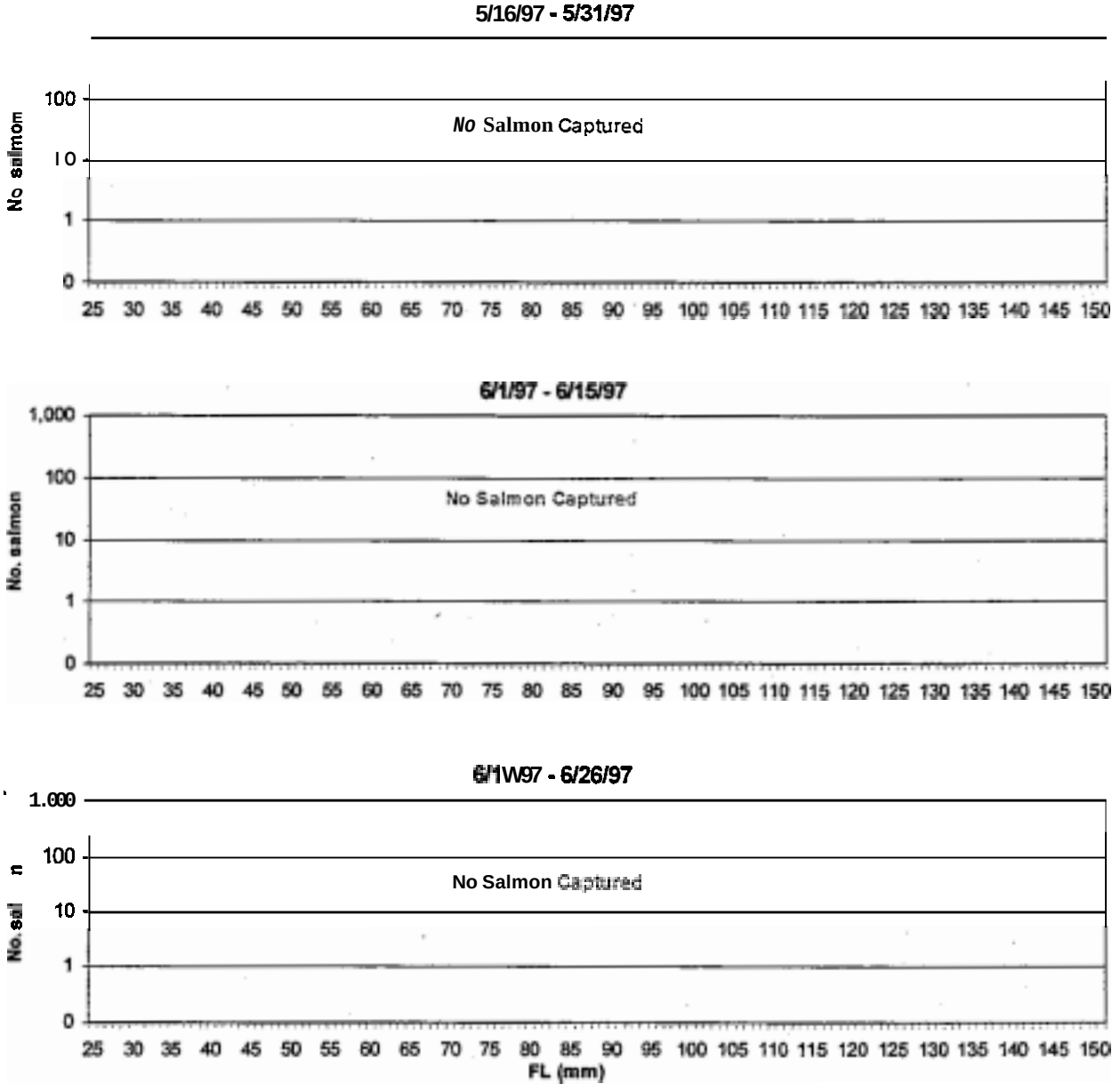




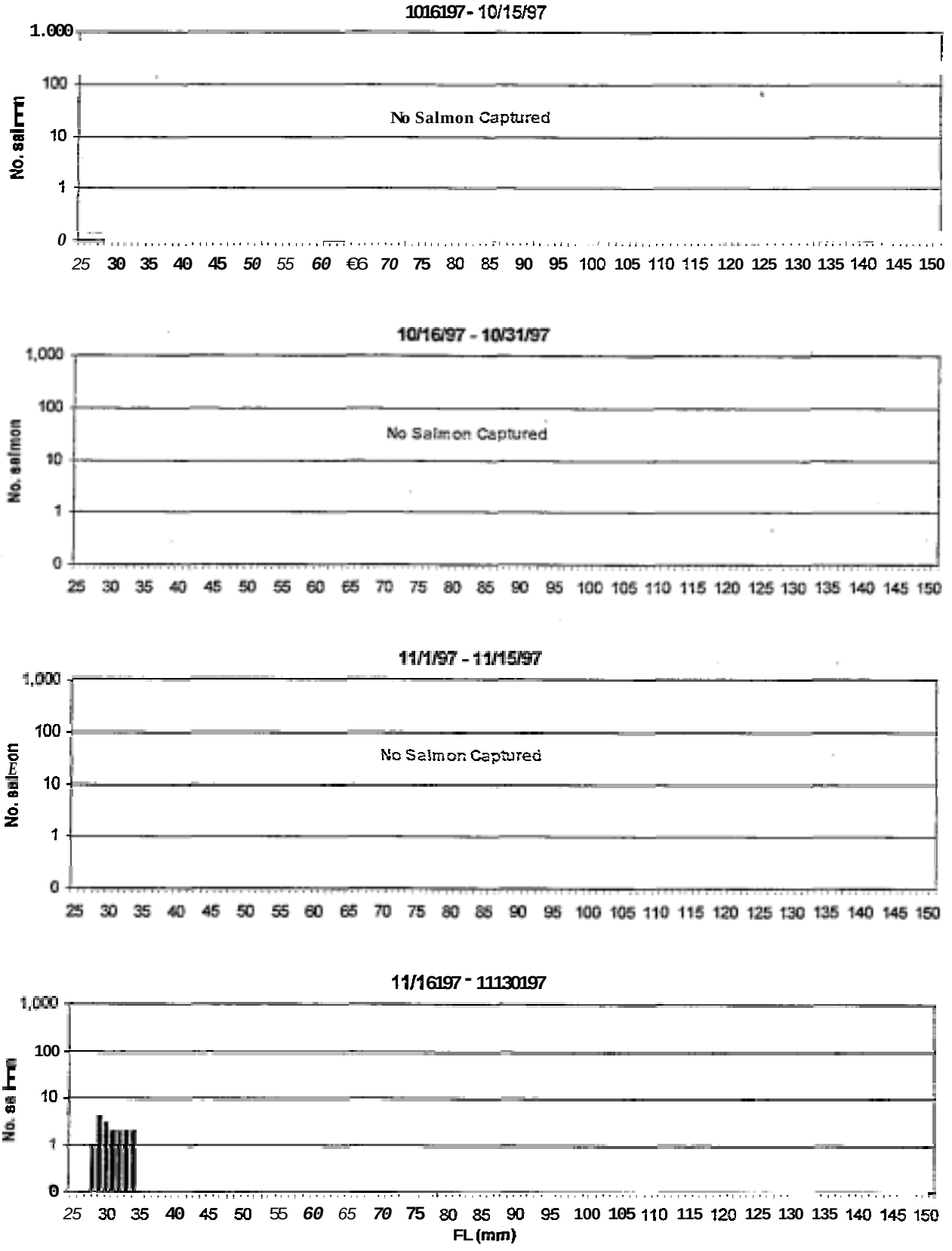
APPENDIX B, FIGURE 2 (continued). Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 17 September 1996 through 26 June 1997. All fish are spring-m chinook salmon except where indicated.



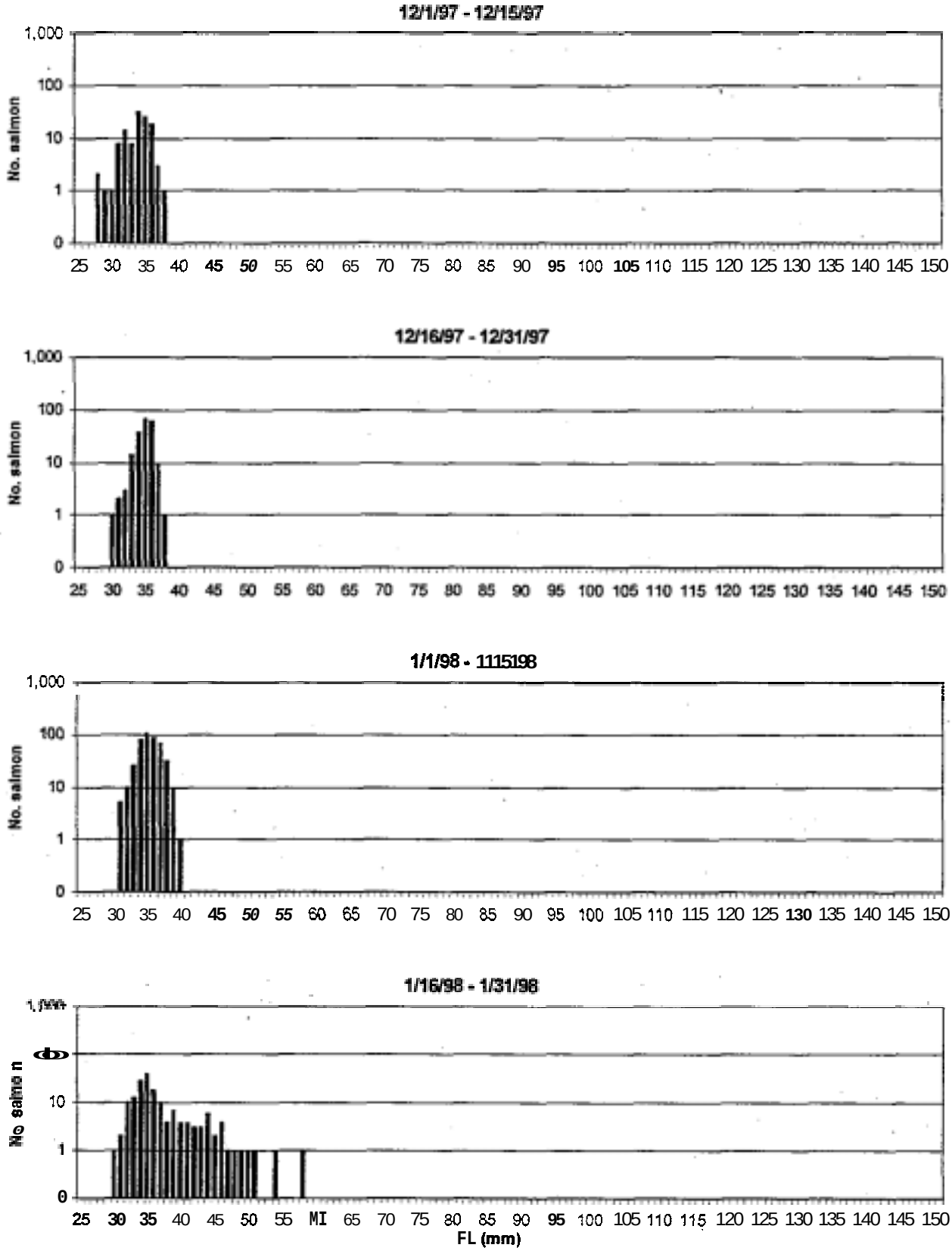
APPENDIX B, FIGURE 2 **(continued).**. Frequency **distribution of lengths of juvenile chinook** salmon **caught and released** *at* **Parrott-Phelan Diversion** Dam **and Adams** Dam **from 17 September 1996 through 26 June 1997.** All **fish are spring-run chinook** salmon **except where indicated.**



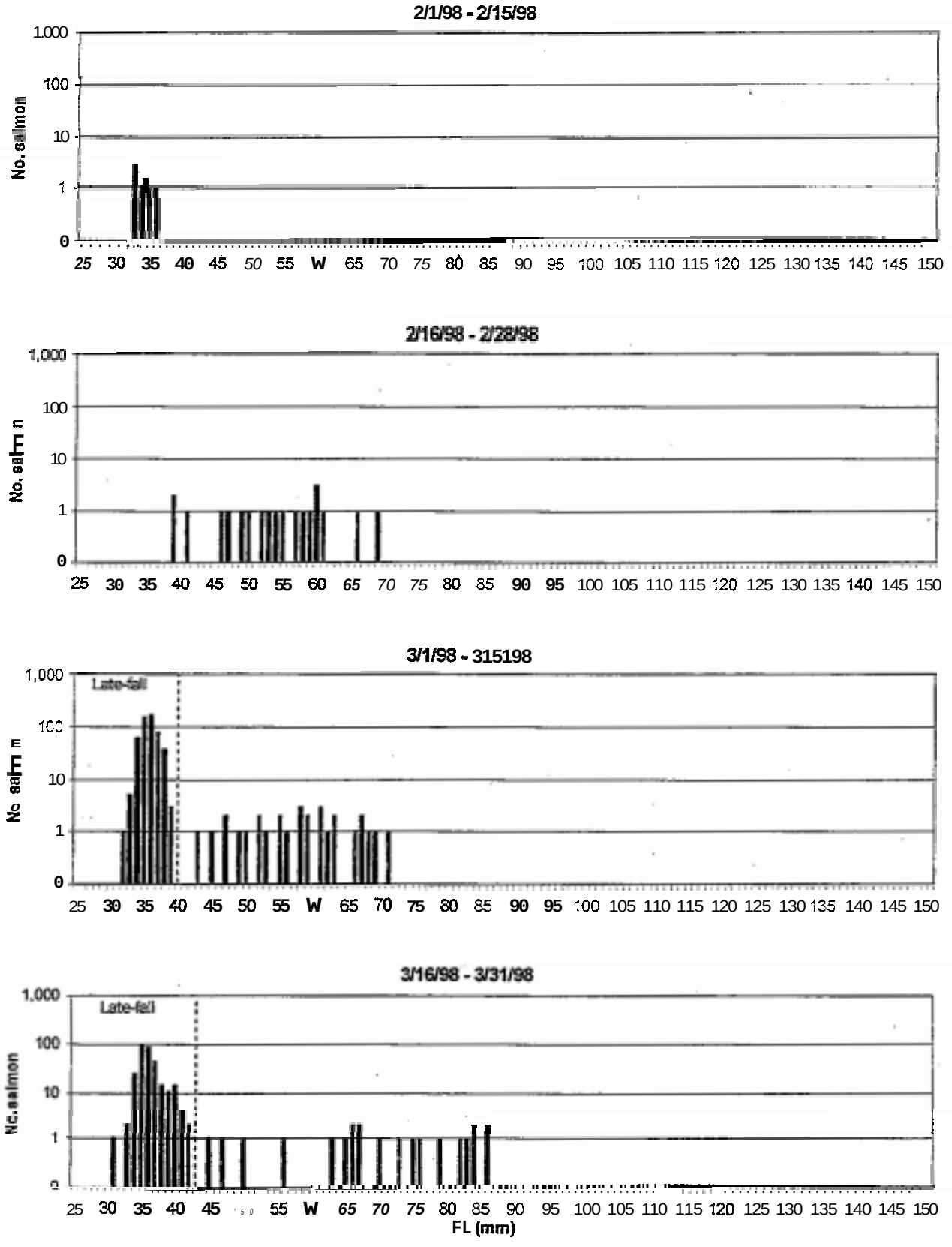
APPENDIX B, FIGURE 3. Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 6 October 1997 through 23 July 1998. All fish are spring-run chinook salmon except where indicated.



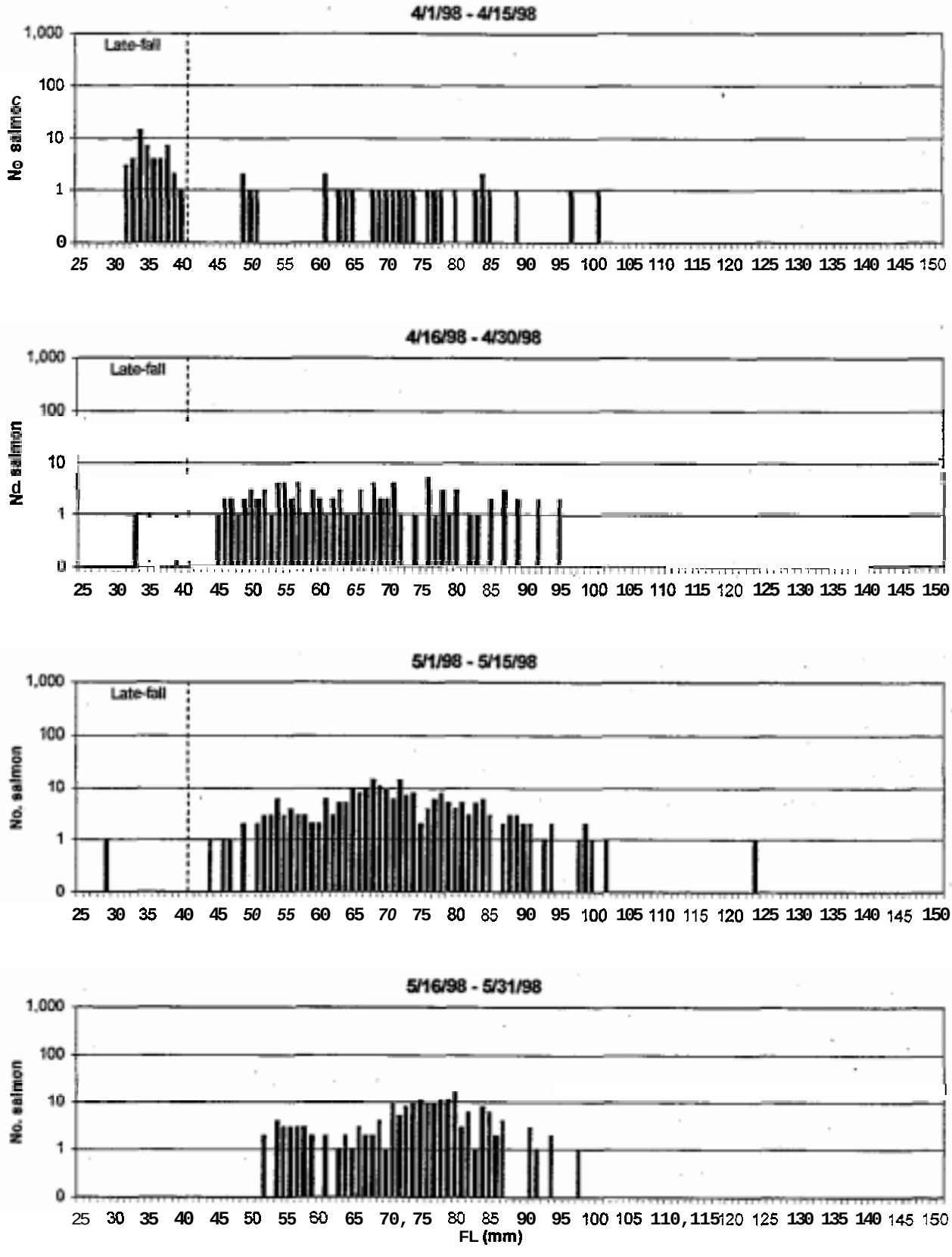
APPENDIX B, FIGURE 3 (continued). Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 6 October 1997 through 23 July 1998. All fish are spring-run chinook salmon except where indicated.



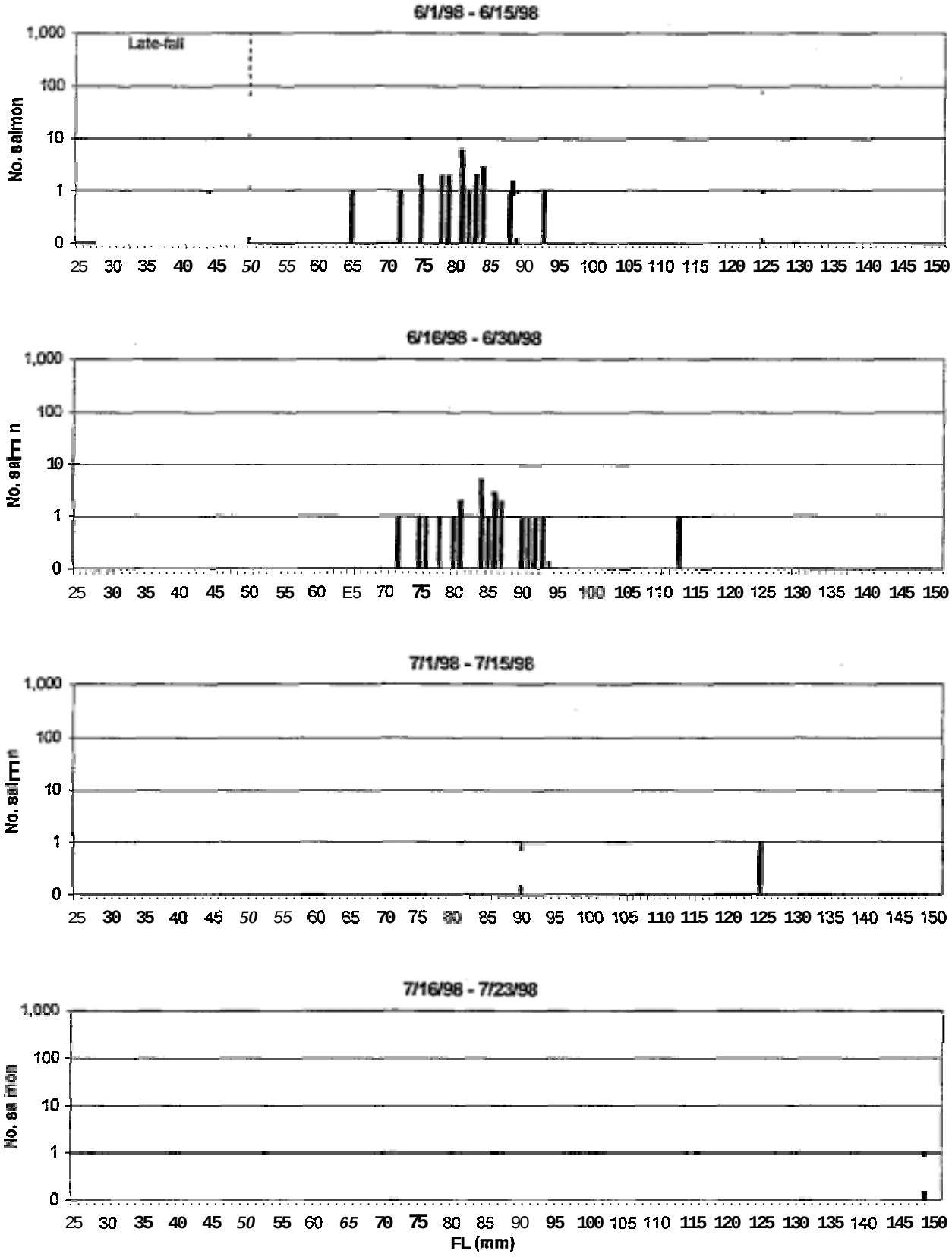
APPENDIX B, FIGURE 3 (continued). Frequency distribution of lengths of juvenile chinook salmon aught and released at Parrott-Phelan Diversion Dam and Adams Dam from 6 October 1997 through 23 July 1998. All fish are spring-run chinook salmon except where indicated.



APPENDIX B, FIGURE 3 (continued). **Frequency** distribution **of lengths of juvenile chinook** salmon **caught and released at Parrott-Phelan Diversion Dam and Adams Dam** from 6 October **1997 through 23 July 1998. All fish are spring-run chinook salmon except where indicated.**



APPENDIX B, FIGURE 3 (continued). Frequency distribution of lengths of juvenile chinook salmon caught and released at Parrott-Phelan Diversion Dam and Adams Dam from 6 October 1997 through 23 July 1998. All fish are spring-run chinook salmon except where indicated



APPENDIX C. Recovery of juvenile chinook salmon tagged and released at Coleman National Fish Hatchery. Salmon were recovered in the Sutter Bypass at West Borrow Weir 1. All salmon were fall-run chinook except for one winter-run and one late-fall-run chinook salmon.

Tag code	Recovery date	FL at recovery	Growth rate (mm/d)	Days before recapture
05-01-01-14-09*	3/21/96	102	n/d	91
05-41-19**	3/22/96	134	n/d	72
05-01-02-05-08	4/17/98	90	0.73	44
05-01-02-05-08	4/23/98	85	0.54	50
05-01-02-05-08	4/28/98	83	0.45	55
05-01-02-05-09	4/16/98	81	0.51	43
05-01-02-05-10	4/19/98	86	0.59	44
05-01-02-05-10	4/21/98	70	0.22	46
05-01-02-05-10	4/22/98	75	0.32	47
05-01-02-05-10	4/29/98	95	0.65	54
05-01-02-05-10	4/29/98	91	0.57	54
05-01-02-05-12	4/18/98	76	0.37	43
05-01-02-05-12	4/20/98	84	0.53	45
05-01-02-05-12	4/29/98	96	0.67	54
05-01-02-05-13	4/18/98	80	0.60	45
05-01-02-05-13	4/22/98	88	0.71	49
05-01-02-05-13	4/27/98	94	0.76	54
05-01-02-05-14	4/20/98	75	0.75	20
05-01-02-05-14	4/20/98	85	1.25	20
05-01-02-05-15	4/17/98	83	1.35	17
05-01-02-05-15	4/20/98	72	0.60	20
05-01-02-05-15	4/22/98	84	1.09	22
05-01-02-05-15	4/29/98	83	0.79	29
05-01-02-06-01	4/18/98	76	0.89	18
05-01-02-06-01	4/21/98	78	0.86	21
05-01-02-06-01	5/1/98	87	0.87	31
05-01-02-06-01	5/5/98	93	0.94	35
05-01-02-06-02	4/30/98	90	1.00	30
05-01-02-06-03	4/20/98	75	0.75	20
05-01-02-06-03	4/22/98	78	0.82	22
05-01-02-06-04	4/22/98	77	0.77	22
05-01-02-06-05	5/1/98	88	0.90	31
05-01-02-06-15	6/1/98	85	0.38	40
05-01-02-06-15	6/2/98	92	0.54	41
05-01-02-07-01	6/1/98	92	0.55	40
05-01-02-07-05	6/1/98	80	0.38	39
05-01-02-07-05	6/2/98	82	0.43	40
05-01-02-07-05	6/2/98	86	0.53	40

* Winter-run chinook salmon
**Late-fall-run chinook salmon

APPENDIX D. Parrott-Phelan Diversion Dam species inventory.

Catostomidae
sucker, Sacramento (*Catostomus occidentalis*)

Centrarchidae
bass, largemouth (*Micropterus salmoides*)
bass, smallmouth (*Micropterus dolomieu*)
bluegill (*Lepomis macrochirus*)
sunfish, green (*Lepomis cyanellus*)
sunfish, redear (*Lepomis microlophus*)

cottidae
sculpin, riffle (*Cottus gulosus*)

Cyprinidae
hardhead (*Mylopharodon conocephalus*)
roach, California (*Hesperoleucus symmetricus*)
shiner, golden (*Notemigonus crysoleucas*)
pikeminnow, Sacramento (*Ptychocheilus grandis*)
dace, speckled (*Rhinichthys osculus*)

Embiotocidae
perch, tule (*Hysterocarpus traski*)

Ictaluridae
bullhead, brown (*Ameiurus nebulosus*)

Petromyzontidae
lamprey, Pacific (*Lampetra tridentata*)

Salmonidae
salmon, chinook (*Oncorhynchus tshawytscha*)
trout, rainbow (*Oncorhynchus mykiss*)
trout, brown (*Salmo trutta*)

APPENDIX E. Sutter Bypass species inventory.

Acipenseridae
sturgeon, white (*Acipenser transmontanus*)

Atherinidae
silverside, inland (*Menidia beryllina*)

Catostomidae
sucker, Sacramento (*Catostomus occidentalis*)

Centrarchidae
bass, largemouth (*Micropterus salmoides*)
bass, smallmouth (*Micropterus dolomieu*)
bluegill (*Lepomis macrochirus*)
crappie, black (*Pomoxis nigromaculatus*)
crappie, white (*Pomoxis annularis*)
pumkinseed (*Lepomis gibbosus*)
sunfish, green (*Lepomis cyanellus*)
sunfish, redear (*Lepomis microlophus*)
warmouth (*Lepomis gulosus*)

Clupeidae
shad, american (*Alosa sapidissima*)
shad, threadfin (*Dorosoma petenense*)

Cottidae
sculpin (*Cottus spp.*)

Cyprinidae
blackfish, Sacramento (*Orthodon microlepidotus*)
carp, common (*Cyprinus carpio*)
goldfish (*Carassius auratus*)
hitch (*Lavinia exilicauda*)
minnow, fathead (*Pimephales promelas*)
shiner, golden (*Notemigonus crysoleucas*)
shiner, red (*Cyprinella lutrensis*)
splittail (*Pogonichthys macrolepidotus*)
pikeminnow, Sacramento (*Ptychocheilus grandis*)

Embiotocidae
perch, tule (*Hysterocarpus traski*)

Ictaluridae
bullhead, black (*Ameiurus melas*)
bullhead, brown (*Ameiurus nebulosus*)
bullhead, yellow (*Ameiurus natalis*)
catfish, channel (*Ictalurus punctatus*)
catfish, white (*Ameiurus catus*)

Osmeridae
wakasagi (*Hypomesus nipponensis*)

Percichthyidae
bass, striped (*Morone saxatilis*)

Percidae
logperch (*Percina caprodes*)

Petromyzontidae
lamprey, Pacific (*Lampetra tridentata*)

Poeciliidae
mosquitofish, western (*Gambusia affinis*)

Salmonidae
salmon, chinook (*Oncorhynchus tshawytscha*)
trout, rainbow (*Oncorhynchus mykiss*)

Appendix B.

The California Department of Fish and Game began the Butte Creek Juvenile Spring-run Chinook Salmon Life History Evaluation in 1995. The project area includes Butte Creek downstream of Centerville Head Dam, inclusive of the Butte Sink and the Sutter Bypass (Butte and Sutter Counties). To date, the project has focused on the life history of spring-run chinook salmon (SRCS). The early objectives of the project are to 1) monitor outmigration timing and relative abundance of age 0+ juvenile SRCS within Butte Creek, 2) document the outmigration of yearling SRCS, and 3) document growth of juvenile SRCS in the Butte Creek system, including the Sutter Bypass. To meet these objectives, rotary screw traps were operated at several locations. Fish trapping locations were 1) Parrott-Phelan Diversion Dam (PPDD): 'One rotary screw trap and one diversion screen trap. 2) Sutter Bypass, West Borrow, Weir 1 (Sutter National Wildlife Refuge): One to two rotary screw traps. 3) East Borrow, Weir 2: One rotary screw trap. Juvenile SRCS captured at PPDD were held for coded-wire tagging. Streamside coded-wire tagging of naturally-produced Butte Creek SRCS occurs near the PPDD site.

The coded-wire tagging program was used for information on growth of juvenile SRCS by determining how and when the juveniles use the Butte Creek system. Juvenile salmon coded-wire tagged upstream in Butte Creek provide method to identify these fish when captured downstream in the Sutter Bypass, mainstem Sacramento River, the Delta, and ocean Our goal is to tag 100,000 naturally-produced juvenile SRCS each year to enable the recovery of enough fish to give us insight. Since these are natural stock salmon, achievement of 100,000 tagged fish is dependent upon hydrological conditions and the ability to operate the traps.

Besides the juvenile SRCS studies, this project also documents adult SRCS spawner escapement. Adult run size is determined by snorkel survey during August when the salmon are holding in deep pools prior to spawning. Experienced Department personnel survey the entire known spawning area. Escapement is used for population trends and as an indicator in attainment of the recovery of SRCS.

The following table summarizes the SRCS data collected to date.

Table 1. Butte Creek SRCS data summary

Year	Adult Escapement	Juveniles Captured		Juveniles Tagged	Ad-clip Recoveries
95'-96'	7,480	PPDD Sutter	119,788 52,284	14,452	61 59 (PPDD) 2 (CNFH)
96'-97'	1,400	PPDD Sutter	1,922 111	449 20 (yearlings)	0
97'-98'	635	PPDD Sutter	10,583 15,480	3,408	41 5 (PPDD) 36 (CNFH)
98'-99'	20,000	PPDD Sutter (west) (east)	410,115 125,385 3,001	104,000 to date	43 (PPDD)

Note: PPDD- Parrott-Phelan Diversion Dam, Butte Creek
CNFH- Coleman National Fish Hatchery, Sacramento River

Appendix B.

By nature of the trapping configuration at PPDD, the diversion screen trapping effort acts as a monitoring program for that structure. The screen structure was installed in the diversion canal in 1995. The salmon captured in this trap are an indication of the number of salmon saved from the diverted water. As many as possible of the salmon captured at PPDD are coded-wire tagged. The 1998-1999 trapping season is the only season we have attained our goal of 100,000 tagged salmon. This is due to the extreme hydrological conditions that California experienced in the last five years. However, in the 1995-1996 trapping season, we released 14,452 tagged salmon. This number is significantly lower than our goal, but produced very valuable information. Five 1995/1996 CWT recaptures were ftom downstream of the Sutter Bypass; four ftom the mainstem Sacramento River and one from the Delta at Chipps Island. These fish ranged in size ftom 77mm FL to 95 mm FL. In 1998, three 1995/1996 CWT were recovered from the ocean sport-fishery; two from Fort Ross to Pigeon Point and one fiom Point Sur to the California/Mexican border. In 1999, one 1995/1996 CWT was recaptured as a spawner in the upper Butte Creek canyon.

These few CWT recoveries have provided important information of the life strategy of SRCS. In year 2001, we hope to have many recoveries of the 104,00 CWT released in the 1998/1999 season. Continuation of this project is .needed for several reasons 1) to recover the tagged SRCS that we have released to date, 2) to produce more successful years of releasing 100,000 or more marked SRCS, and 3) to continue trapping and tagging SRCS for evaluating past and future restoration efforts.

The current study is funded by AFRP through March 2001.